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COMPUTER SIMULATED SOCIAL PRESSURE

by



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A THESIS

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UNIVERSITY OF ALBERTA  
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and  
recommend to the Faculty of Graduate Studies for acceptance,  
a thesis entitled "Computer Simulated Social Pressure"  
submitted by Clifford Albert Marshall in partial fulfilment  
of the requirements for the degree of Master of Education.





## ABSTRACT

This study was designed to investigate the basic effect of incorrect feedback on perceptual judgement in a simple vertical line judgement situation. A further purpose was to determine the effect upon reaction time in decision making situations under varying conditions of pressure.

Vertical line judgement tasks were devised that resulted in two ten question segments. Each question consisted of one frame showing a single stimulus and a second frame containing five stimuli from which the subject was required to identify the first stimulus. A constant distance was maintained between the five lines, and their heights were different by a constant. Each of the five line positions contained two correct answers, two smaller answers and two larger answers within the set of ten questions. There were seven groups of subjects which comprised the control group, two groups receiving the correct answers, two receiving answers which were smaller than the correct answers, and two groups which were given answers larger than the correct answer. The answers were presented by one of two methods. The first method used to obtain incorrect perceptual judgement consisted of a simple statement given by the computer. This statement supposedly contained the correct answer to the question, and was



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presented prior to the question. The second method was intended to simulate group pressure and attempted to sway the judgement of the subject by presenting the peer group "choices".

Performance recordings were obtained from the IBM 1500 computer and analyzed with respect to the number of correct answers chosen, answer reaction time and time spent reading biased material. Data analysis indicated significant interaction between main effects.

The first major analysis dealt with the correct responses. The main psychological variables were method of presentation and the direction that the experimenter attempted to bias perceptual judgement.

The second analysis concerned answer response times for the question sets and groups. Reaction time decreased steadily with increasing experience of subjects and significant differences existed only during the second question set.

The time spent in reading biased material was also analyzed through the main effects. The initial presentation of the material resulted in significant differences between groups, with simulated group pressure resulting in greater time spent in reading than in computer pressure groups.



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## TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION . . . . .	1
	Background . . . . .	1
	Definitions . . . . .	4
	Hypotheses . . . . .	6
II.	SOME RELATED LITERATURE AND IMPLICATIONS	
	FOR TASK DEVELOPMENT . . . . .	7
	General Methods . . . . .	7
	Authority . . . . .	9
	Sequencing of Biased Material . . . . .	11
	Single Sided Argumentation . . . . .	12
	Feedback and Knowledge of Results . . . . .	13
	Feedback and Investigator Bias . . . . .	15
	Individual Task Perception . . . . .	16
	Size of Group . . . . .	18
	Peer Groups . . . . .	19
	Age of Subjects . . . . .	19
	Sex of Subjects . . . . .	20
	Background of the Subject . . . . .	21
	Unanimity of Group Consensus . . . . .	21
	Item Difficulty and Yielding . . . . .	22
	Extinction of Learning Set . . . . .	24





CHAPTER	PAGE
III. PROJECT PREPARATION . . . . .	26
The Pilot Studies . . . . .	26
Development of the Task . . . . .	26
Initial Computer Based Studies . . . . .	32
IV. METHODS AND PROCEDURES . . . . .	33
The Sample . . . . .	33
The Task . . . . .	33
Research Design . . . . .	35
Question Set Construction . . . . .	38
Data Collection Methods . . . . .	39
1500 Computer Program . . . . .	39
V. THE RESULTS . . . . .	40
Experimental . . . . .	40
Post Attitude Questionnaire . . . . .	65
VI. FINDINGS AND IMPLICATIONS FOR FUTURE RESEARCH . . . . .	75
Findings . . . . .	75
Discussion . . . . .	76
Implications . . . . .	77
BIBLIOGRAPHY . . . . .	80
APPENDICES . . . . .	90
APPENDIX A . . . . .	90
Methods of Pressuring Subjects and Question . . . . .	91



CHAPTER	PAGE
APPENDIX B . . . . .	92
Correct Answer and Reaction Time Mean	
Tables . . . . .	93
APPENDIX C . . . . .	99
Reading Time Mean Tables . . . . .	100
APPENDIX D . . . . .	103
Graphed Reaction Time Means . . . . .	104
APPENDIX E . . . . .	108
Graphed Reading Time Means . . . . .	109
APPENDIX F . . . . .	111
Reading Time Means Comparing Pressure	
Methods . . . . .	112
APPENDIX G . . . . .	113
Post Attitude Questionnaire . . . . .	114
APPENDIX H . . . . .	115
Computer Program Instructions . . . . .	116
APPENDIX I . . . . .	117
Sample Task . . . . .	118
APPENDIX J . . . . .	120
Line Lengths for Tasks . . . . .	121
APPENDIX K . . . . .	123
Research Design . . . . .	124
APPENDIX L . . . . .	125
Letter to Students Explaining Project . .	126



# LIST OF TABLES

TABLE	PAGE
1. ANALYSIS OF VARIANCE ON CORRECT ANSWERS . . .	42
2. SIMPLE MAIN EFFECTS OF A AT LEVEL $b_1$ , $b_2$ , $b_3$ AND $b_4$ IN TERMS OF CORRECT ANSWERS . . . .	44
3. SHEFFE MULTIPLE COMPARISONS OF SAMPLE MEANS FOR FACTOR A ON LEVEL $b_2$ IN TERMS OF CORRECT ANSWERS . . . . .	45
4. SHEFFE MULTIPLE COMPARISONS OF SAMPLE MEANS FOR FACTOR A ON LEVEL $b_3$ IN TERMS OF CORRECT ANSWERS . . . . .	46
5. MEAN NUMBER OF INCORRECT ANSWERS CHOSEN FOR QUESTION SETS ONE AND FOUR . . . . .	51
6. ANALYSIS OF VARIANCE ON QUESTION REACTION TIMES . . . . .	52
7. SIMPLE MAIN EFFECTS OF A AT LEVELS $b_1$ , $b_2$ , $b_3$ AND $b_4$ IN TERMS OF REACTION TIMES . . . . .	53
8. SHEFFE MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR A ON LEVEL $b_2$ IN TERMS OF REACTION TIMES . . . . .	55
9. ANALYSIS OF VARIANCE ON READING TIMES . . . .	59
10. SIMPLE MAIN EFFECTS OF A AT LEVELS $b_2$ AND $b_3$ IN TERMS OF READING TIME . . . . .	60





TABLE	PAGE
11. SHEFFE MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR A ON LEVEL $b_2$ IN TERMS OF READING TIME . . . . .	61
12. CHOICES ON POST ATTITUDE QUESTIONNAIRE . . .	66
13. CHOICES ON POST ATTITUDE QUESTIONNAIRE . . .	68
14. CHOICES ON POST ATTITUDE QUESTIONNAIRE . . .	70
15. CHOICES ON POST ATTITUDE QUESTIONNAIRE . . .	71
16. CHOICES ON POST ATTITUDE QUESTIONNAIRE . . .	73
17. MEAN CORRECT ANSWERS FOR ALL GROUPS ACROSS ALL QUESTION SETS . . . . .	93
18. REACTION TIME MEANS FOR ALL GROUPS ACROSS THE FOUR SETS OF QUESTIONS . . . . .	94
19. MEAN REACTION TIMES FOR THE FIRST TEN QUESTIONS ACROSS GROUPS . . . . .	95
20. ANSWER REACTION TIMES FOR THE SECOND TEN QUESTIONS ACROSS GROUPS . . . . .	96
21. MEAN REACTION TIMES FOR THE THIRD QUESTION SET ACROSS THE GROUPS . . . . .	97
22. MEAN REACTION TIMES FOR THE FOURTH QUESTION SET ACROSS GROUPS . . . . .	98
23. GROUP MEANS FOR READING TIME OF BIASED MATERIAL . . . . .	100



TABLE	PAGE
24. MEAN REACTION TIMES FOR THE SECOND TEN QUESTIONS ACROSS GROUPS . . . . .	101
25. READING TIME MEANS FOR THE THIRD QUESTION SET ACROSS GROUPS . . . . .	102
26. QUESTION SETS ONE AND FOUR . . . . .	121
27. QUESTION SETS TWO AND THREE . . . . .	122



# LIST OF FIGURES

FIGURE		PAGE
1.	CORRECT ANSWERS GRAPHED IN TERMS OF GROUP MEANS ACROSS THE QUESTION SETS . . . . .	43
2.	NUMBER OF CORRECT ANSWERS ACROSS ALL GROUPS FOR THE FIRST TEN QUESTIONS . . . . .	49
3.	GROUP REACTION TIME MEANS ACROSS THE FOUR SETS OF QUESTIONS . . . . .	56
4.	REACTION TIME MEANS ACROSS THE FORTY QUESTIONS FOR ALL GROUPS . . . . .	58
5.	GROUP MEANS FOR READING TIMES OF BIASED MATERIAL IN SECONDS . . . . .	63
6.	CORRECT ANSWERS ACROSS LINE POSITIONS FOR ALL SUBJECTS . . . . .	64
7.	GROUP REACTION TIME MEANS ACROSS THE FIRST TEN QUESTIONS . . . . .	104
8.	GROUP REACTION TIME MEANS ACROSS THE SECOND TEN QUESTIONS . . . . .	105
9.	MEAN REACTION TIMES FOR THE THIRD QUESTION SET ACROSS THE GROUPS . . . . .	106
10.	MEAN REACTION TIMES FOR THE FOURTH QUESTION SET ACROSS THE GROUPS . . . . .	107
11.	GROUP READING TIME MEANS ACROSS THE SECOND TEN QUESTIONS IN SECONDS . . . . .	109



FIGURE		PAGE
12.	READING TIME MEANS FOR THE THIRD QUESTION SET ACROSS THE GROUPS . . . . .	110
13.	READING TIME MEANS ACROSS THE TWENTY TREATMENT QUESTIONS COMPARING SIMULATED GROUP PRESSURE AND COMPUTER PRESSURE . .	112
14.	FIRST STIMULUS . . . . .	118
15.	ALTERNATE SET . . . . .	119
16.	RESEARCH DESIGN . . . . .	124





## CHAPTER I

### INTRODUCTION

#### I. BACKGROUND

Since the mid-1950's growing dissatisfaction with outmoded methodologies of education has brought about increased pressure for new ways of individualizing instruction. Such pressures, accompanied by the significant advances in computer technology have resulted in the emergence of Computer Assisted Instruction (CAI). The application of computers to the educational setting has provided additional evidence to some that we are on the brink of an Orwellian world. While it is unlikely that such a view is held by many, the field of electronics and computing technology has achieved a status that at the least must be described as respected. Such status is in part due to the increasing complexity of modern computing systems.

While the question of brainwashing by computers may be rationally discarded with the argument that instructional programs are essentially the products of human programmers and not cold electronic machines, it is still interesting to speculate about the effects of programming errors. Such errors might lead to misinformation and misunderstanding. Similarly, a controlled program will allow the study of factors which were difficult or even impossible to measure



prior to the introduction of the computer.

One of the most established principles in social psychology has been that group pressure can cause an individual to deny the accuracy of his own perceptual judgments to gain group approval. Studies by Asch (1951, 1952, 1955, 1956) and later by Crutchfield (1954a, 1955, 1959a, 1959b, 1962) have shown this. The major problem which was investigated in this thesis was whether or not the principle could be extended to the computer as an absolute authority and as an instrument for simulating a social group. For this purpose, a simple Asch-type task was constructed which consisted of several vertical lines. The subject was required to view a single line for a few seconds and then view a second set of alternate lines from which he was to identify the first line. The alternate set consisted of five lines, of which only one matched the first stimulus. This "correct" answer had two alternatives, one of which was three-quarters of an inch larger and one which was three-quarters of an inch smaller. These two lines were used as being correct answers when the pressure was applied to force the subject to change his opinion.

In order to obtain some interesting baseline comparisons seven groups were formed. The first group was simply a control group of subjects which did not



actually receive any social pressure by any method during the four sets of questions. The primary purpose was to obtain a standard of comparison for the treatment groups across the four sets of questions, and to determine attitudes toward the computer after various forms of treatments had been placed on the subjects.

The second group, fourth group and sixth group all received simulated group pressure by means of the computer, to choose a specified answer. For these cases, simulated group answers consisting of the presentation of biased material of the form "8 of your friends have answered this question. Their choices are shown below." Beneath this statement the possible answers were listed as well as the number of the subject's friends who had supposedly chosen each. To obtain maximum pressure, the experimenter controlled the number of persons who chose the simulated answer, and stated that no one had chosen any of the other answers. The subject was then required to choose one to match from the alternate answers set (see Appendix A and I). Only group two received the correct answers. In the case of group four, the answer supplied was smaller than the correct answer. Group six was supplied with an answer larger than the correct answer. Thus, in all of the above groups, the subject was forced to choose





between his visual perception and the socially perceived answer. This created dissonance in groups four and six when they received the incorrect answers.

The other groups, namely the third, fifth, and seventh, were treated with pressure in the form of the computer acting as an authority. The third group was given the answer which was correct, while the fifth group received an answer which was smaller than correct and the seventh received an answer which was larger than correct.

The questions which the groups received consisted of forty items divided into four sets of ten questions each. The first ten questions were used to establish the approximate number of correct answers expected for each group prior to treatment. The second and third sets of questions were designed to be used as the treatment sets to ascertain if judgement could be swayed by reinforcement of incorrect responses, and the last ten questions formed a set which was used to determine if the incorrect choices had been conditioned to form a learning set which might persist after pressure had been removed.

## II. DEFINITIONS

Biased Material - Material which is placed prior to the

presentation of an individual trial or question for the purpose of swaying the perceptual judgement of



the subject.

Computer Pressure - Pressure exerted by the computer as an authority to force the subject to accept the answer the experimenter wants him to accept.

Conformity - Yielding by the subject to the decision given by the group "answer" or the computer "authority".

Correct Answer - The answer demanded by the biased material.

Dissonance - Confusion in the mind of the subject caused by the refutation of the answer presented by the biased material by his perceptual judgement.

Feedback - Feedback occurs when the subjects response is judged correct. The response is correct only if it is the same as that presented by the biased material or propaganda which may be true or false.

Individual Trial Time - The time taken by the subject to respond during the trial.

Perceptually Correct Answer - The answer which is correct when measured by the ruler (see Appendix J for the line lengths used).

Set - A persistence to choose the answer that one has been trained to choose in the past. Measured when training has been removed.



Simulated Group Pressure - Pressure applied by the computer

which supposedly represents the judgements of the peer group, but is actually controlled by the experimenter.

### III. HYPOTHESES

1. No significant differences exist in terms of response time for the groups across the forty questions.

2. There is no significant difference in terms of reading response time between the second set of questions and the third set of questions across the groups.

3. There is no significant difference in terms of the number of perceptually correct answers for the groups across the four sets of ten questions.

4. There is no significant difference in the number of correct answers chosen on the basis of line position.

In summary then, the first problem to be investigated concerns whether the computer can affect human judgement by means of two forms of pressure. The second problem regards whether any yielding produced by reinforcement persists when the pressure is removed.



## CHAPTER II

### SOME RELATED LITERATURE AND IMPLICATIONS FOR TASK DEVELOPMENT

#### I. GENERAL METHODS

There is a great deal of literature which examines the individual in a situation in which group pressure or an authority gives information which disagrees with the perceptually correct answer for a simple perceptual judgement. Two basic techniques have evolved for the examination of the phenomena. The more powerful of these is the Asch technique (1956) where an individual is placed in the position of having either to choose an incorrect answer in order to agree with the group, or to choose the correct perceptual answer and disagree with the group in a face to face situation. The technique is most effective when the subject must disagree with a unanimous group. The trials consist of matching a line a few inches long with a similar line contained in a group of lines of various lengths. In the Asch experiments the lines were presented simultaneously and usually at a distance of several feet from the subjects who sat in a group. The confederates were seated so that they answered first and the subject gave his answer last. Even when the errors made by the confederates were as large as one or two inches, 37% of the subjects conformed with the false majority on at least half of the trials. In the control group, where the subjects were allowed to choose





an answer without pressure, virtually no errors occurred.

In the second method which is usually known as the Crutchfield technique (1954b), five persons are seated individually in screened booths. Speaking between subjects is not allowed. Instead, the subjects are required to view supposed responses made by the four other members of the "group" prior to making their own choice. These responses are in fact controlled by the experimenter and each subject is made to believe that he is the last of the five to express judgement regarding the simple perceptual task. The tasks are similar to those used by Asch and the responses of the other members are communicated by means of a panel of lights which indicate "choices". Similar studies have been conducted by Harvey (1964) and Sherif and Sherif (1956).

Deutch and Gerard (1955), and Levy (1960) noted that with identical items, the Asch technique obtains greater yielding than the Crutchfield technique. However, the latter is adaptable to the computer while the former is not. It might also be pointed out that the Crutchfield technique allows the experimenter to control completely all statements, questions, feedback, exposure time and pauses in the experiment. As the present study was concerned with the external manipulation of the subjects' environment, such control was of extreme importance in obtaining useful results. The remainder of this chapter will deal with



the factors which the experimenters in this area have found to be of significance in pressuring the subject to respond with incorrect judgements.

## II. AUTHORITY

Hovland (1957) noted that there was more opinion change when the group heard a conclusion explicitly stated by the authority and Thistlewaite (1955b) noted further that this is only of importance among less intelligent subjects. Kelley and Woodruff (1956) and Asch (1940) state that the authority of a professor is an aid in persuading students to accept data and Kelman (1953) stated that a judge is ranked higher than a criminal in authority to judge a criminal case. Hovland (1952) noted that an audience rated an importer as being biased in his judgements while an economist was rated as a better authority on the question of the devaluation of the dollar. Granted that, in the above cases, the authority should have better arguments to support his case in addition to the mere fact that he holds a position of power. However, the remarkable thing about each of these studies is that the experimenter played the same tape to each of his audiences, changing only the introduction of the speaker.



Jones, Wells and Torrey (1958) examined the effect of authoritarian repudiation and confirmation of the subject's judgement by the experimenter. According to their results repudiation in this case is more powerful than is confirmation in increasing yielding by the subject.

From the above studies, it will be noted that "experts" and their opinions are thought of as unbiased by an audience. In fact, this point may be used by the experimenter who can create an "expert" to change the opinions and judgments of an audience.

Lefkowitz (1955) found that the status of the authority was dependent upon dress. Expensive clothes induced subjects to follow the leader in breaking minor traffic rules to a greater extent than if the leader was wearing poor clothes. Under normal conditions, the pedestrians obeyed the traffic signals in over 99% of the cases. However, with maximum status clothes, 14% violated the signals while with low status clothes, 4% violated the signals. Other studies investigating this aspect of authority which is dependent upon dress, have been conducted by Freed (1954) and Kimbrell and Blake (1958).

In the study then, it was necessary to consider the source of authority which could be used. The computer, being a rather large array of hardware, is impressive and may be used as a source of authority. The popular



notion of the computer as a "giant brain" should also aid in supplying the desired source of authority. Furthermore, reinforcement for incorrect answers was thought to be useful in obtaining consent. This was further strengthened by supplying the first name of the subject in the reinforcing sentence to personalize the information. The material was presented in the form of a sentence which stated: "Very Good John, Let us try the next question!" If the subject chose an answer other than that supplied by the computer, no comment was made and he simply began the next question. The subject was able to proceed at his own speed and read initial instructions more than once if he so desired. There was no attempt to confuse the subject directly. Instead, question numbers were supplied and directions attempted to explain the experiment and how the computer would aid the subject (see Appendix H).

### III. SEQUENCING OF BIASED MATERIAL

The sequence of the material in an individual trial has been shown to be an important consideration in obtaining consent. Studies which have investigated this aspect of control include Kiesler and Kiesler (1964), Gerard and





Greenbaum (1962) and Fisher (1956). All of the studies suggested that material which is to sway the subject's judgement should be placed before the subject is put in a forced choice situation. Freedman (1964) stated that if this is not done, there is an increased tendency by the subject to reject the communication in favor of his previous decision. He further hypothesized that this is an actual rejection and not a distortion of memory by the subject. In the experiment conducted here, the material was placed prior to the question for each trial in accordance with the information above.

#### IV. SINGLE SIDED ARGUMENTATION

Another important problem is whether the biased material should be single or double sided in nature. Hovland (1958) pointed out that the side of the issue presented first is likely to have the greatest influence on opinion under the following conditions:

1. When cues as to the incompatibility of different items of information are absent.
2. When the contradiction material is presented by the same communicator.
3. When the committing actions are taken only after one side of the issue has been presented.
4. When the recipient has only a superficial interest in the issue.



As the communication was being given under a condition of group pressure or authority, a single sided form of argumentation was used, and the second point is not of importance. However, the other points are of direct relevance to the study. Lumsdaine and Janis (1953) conducted a study that revealed the ineffectiveness of one sided communication. It should be pointed out however, that group pressure was not directly involved. The results showed that the one sided communication was effectively wiped out by a countercommunication, whereas a two sided communication tended to retain its effect. There does not appear to be any consensus regarding the superiority of either form, which would indicate that the techniques and methods as well as audience factors have not been clearly specified as yet. Some light is cast on the problem by Hovland (1949) who found that upon closer examination one sided communications were more effective with persons of lower education, while two sided communications were more effective with persons of higher education. No clear psychological explanation was offered for the findings.

#### V. FEEDBACK AND KNOWLEDGE OF RESULTS

Kinchla (1955) stated that false information feed-



back reduced the overall probability of a correct response. For the purposes of this study, both false and correct information feedback were necessary. However, the feedback was not used in any manner that might be viewed as a direct attack on the subject. Such an approach could lead to resistance when the subject perceived that he was being threatened. No reason was given for the subject to question or resist the computer aid as would be the case if the computer attacked the choice of the subject. Incorrect answers, as noted earlier resulted in the subject being moved to the next question after a three second pause, rather than attempting to force the acceptance of the answer displayed on the CRT by the computer. No re-examination of choices was permitted. Instead, the emphasis was placed on attempting to condition the subject to accept the computer based answers. To this end, reasons were planted in the computer program instructions regarding possible causes of discrepancies in the judgement of the subject (see Appendix H). This approach was adopted partly due to Thistlewaite (1955a) who noted that if conflicting facts are salient in feedback, failure to note this may be interpreted as bias by the subject. Hence, the program instructions led the subject to believe



that he would often disagree with the computer answers due to the difficulty of the questions and his own inexperience in judging vertical lines. The purpose was to reduce the possibility of the subject having to reexamine his decision when he disagreed with the computer. As the subject received only sequenced material with controlled exposure time, he had no method of monitoring his decisions and discovering the duplicity. The method is somewhat akin to the description of the Chinese indoctrination program described by Schein (1958). Negative feedback must be reduced to minimize the threat to the individual. Janis (1953) conducted a study which examined the effect of fear as a threat to change opinion and found it markedly ineffective. Similar results were found by Lucas (1950) who discovered that the advertizing industry used fear in only 5 ads from a total of 226.

## VI. FEEDBACK AND INVESTIGATOR BIAS

Orne (1962) pointed out that the investigator may suggest the shade of reply expected, and the subject by assisting either consciously or unconsciously may upset the experimental results. Similarly, Rosenthal (1966) claimed that those experimenters who expect or desire better performance from their subjects may significantly bias the





experiment towards the desired outcome by subjectively favoring the treatment groups. The problem of experimental favor and conscious or unconscious revealing of the basic duplicity by either word or manner might be overcome by having someone who knows nothing of the purpose of the experiment administer it.

In the present experiment, scoring was objective in the sense that the subject either obtained the correct answer or did not. Hence, the problem of subjective scoring did not occur. Similarly, as all subjects received the same instructions regarding the experiment via computer any understanding of the duplicity or suggestion of the shade of reply expected would be dependent upon the degree to which the subject could extract information inferentially from the written context of the instructions. The ability to do this should not have differed across the groups because of random assignment, and secondly the instructions are less subject to giving this form of information when written than when spoken.

## VII. INDIVIDUAL TASK PERCEPTION

Crutchfield (1962) noted that the individual may react to the dissonance created by having disagreed with



an incorrect judgement in several ways, depending upon how he perceives the material. He may:

1. Blame himself. (leads to yielding)
2. Blame the group. (leads to resistance)
3. Reconcile discrepant judgements. (leads to yielding)
4. Accept the fact of individual differences.  
(leads to resisting)
5. Avoid evidence. (resistance occurs)
6. Resolve that there is deception. (resistance)

Crutchfield (1958) noted that approximately 17% of the subjects displayed insight into the experimental deception on the basis of a post questionnaire. He also supported the idea that the likelihood that the subject will yield can be raised by feedback to reinforce the tendency to conform.

Finally, knowledge of the experimenter's purpose apparently does not necessarily cause the subject to reject the biased communication. Sophisticated subjects who knew or believed that the experiment was rigged conformed less than the deceived subjects yet, the sophisticated subjects as compared with controls were significantly influenced by group pressure on visual and informational items, according to an experiment conducted by Allen (1966).

The juxtapositioning of correct perceptual answers and the computer presented answers would normally cause



dissonance. The computer instructions as mentioned earlier were designed to aid the subject in rationalizing any such dissonance.

The problem of dissonance was also reduced by leading the subject to believe that he could not hope to get all of the questions right and would disagree with the problems when they were too difficult for him. This is similar to the study by McGuire (1964) who "inoculated" the subjects with propaganda prior to measuring the effectiveness of it. The small doses were given to build immunity which could be strengthened by minor attacks which force the subject to build counter arguments to strengthen his position. The computer "aid" was described in the present study as being an aid for practice during the middle twenty trials. The first ten trials were presented as establishing how well the subject did prior to receiving help, and the last ten trials supposedly composed the test.

#### VIII. SIZE OF GROUP

Crutchfield (1962) pointed out that group pressure increases with group size to approximately four persons and then remains relatively stable for groups of fifteen or more. For the present study the size of the "group" opposing the individual varied from six to nine persons



in unanimous agreement.

#### IX. PEER GROUPS

Gerard (1954), Jackson (1958) and Ellerton (1951) all found greater conformity when the groups were more attractive to the members. Since, presumably, classmates have an effect on the decisions of any single member and due to the fact that the class is a cohesive and easily obtained unit, they were used for the present study.

#### X. AGE OF SUBJECTS

Berenda (1950) used the Asch method with children between the ages of seven and thirteen. Eight confederates were also used. The younger children from seven to ten tended to conform more than did the older children of from ten to thirteen in a situation using face to face group pressure. Tuddenham (1961a), with the Crutchfield method and a group of college students plus a group of children of from nine to twelve years, found that younger children conformed more than did the adults and that this difference was not pronounced.





## XI. SEX OF SUBJECTS

Coleman (1968) obtained correlations of .89 for women and .58 for men between item difficulty and tendency to conform. Similarly, Di Vesta (1958) supported the contention that females conform to a greater extent than males for memory tasks than for visual tasks, and for perceptual items than for attitudinal ones. Tuddenham (1961a), claims that females of from nine to thirteen and at the college level conform more than males. He did not state the form of items used in distinguishing differences due to this factor. In another study by the same experimenter (1958), females were found to yield more often in mixed sex groups and especially when there were more males than females. Among college students females tended to conform more than males, but with subjects older than thirty-five, these differences began to decrease rapidly. McDavid (1965) concluded that with females, conformity does not occur more often than with males when feminine and neutral items are used. Conformity occurs only with masculine items. Abelson and Lesser (1959) found that the persuasibility or tendency to seek agreement with the attitudes of a communicator (related to conformity) is similar for a given subject in different situations. However, the topic may change the persuasibility



drastically, especially where personal relevancy occurs. Dukes (1951) noted that personal relevancy may upset judgement and explained that this was discovered through the following procedure. The task involved judging the weight of two jars of identical weight. One jar was filled with candy and one with sand. Children of from six to fifteen consistently judged the jar containing candy as being heavier.

## XII. BACKGROUND OF THE SUBJECT

Luchins (1961) concluded that one should remember that the different backgrounds of subjects may contribute to higher or lower performance. Persons who are required to make linear judgements on their job, will be more certain of their answer than those who do not have such experience. According to Milgram (1961) the Danish people would be more conforming than the French, probably due to the nature of their close knit family and governmental structure. The factor probably holds for all other groups also.

## XIII. UNANIMITY OF GROUP CONSENSUS

In all of the experiments conducted by Asch and



Crutchfield, the most significant results were obtained when the individual faced unanimous group pressure. If any individual agreed with the subject, the strength of the group was seriously weakened. This is one of the most powerful features and Asch especially notes it (1951, 1952, 1956). Where expert opinion is levelled against an individual, Weiss (1964a) concludes that greater opinion formation occurs when the arguments are advocated by all the experts rather than when arguments are advocated by only half the experts. For the purpose of this study then, unanimous opinion was levelled at the individual with the two methods of pressure being the "group" and the computer as "expert".

#### XIV. ITEM DIFFICULTY AND YIELDING

Tuddenham (1961b) concluded that if the distorted group judgement is within the range of judgements acceptable to the individuals, the net effect is to increase the homogeneity of judgements. If the distorted judgement lies outside the range of acceptable judgements, the net effect is a decrease in homogeneity. However, there is some disagreement in this area. Coleman (1958) and McDavid (1964, 1966) in using the Crutchfield method claim that yielding is far greater on difficult items than on easy



items. Furthermore, Luchins (1955) noted that there is little disparity in judgement provided there is little ambiguity. However, with ambiguity subjects conformed to the confederates' false answer, especially when the confederate was supported as correct by the experimenter. However, Luchins (1956) noted that with children who are given linear and metric rulers in making judgements in measurement, the children tended to rely on the ruler rather than accept the judgements of the child who answered first. Olmstead (1955) using the Asch method, had college students attempt a task consisting of group counts of metronome clicks. Each subject could hear the others via headsets and the rate of clicks and the frequency of uniformity were positively related. With a rate of 180 clicks a minute one discrepancy produced the most conformity. Less conformity occurred with a discrepancy of two and conformity again increased with a discrepancy of three or more. In post experimental interviews, conformity was related to the subjects assuming that they had miscounted in the case of one discrepancy. In the case of two discrepancies, conformity was related to the assumption of a 50-50 chance of being correct. When the discrepancy increased to three clicks, the relation appeared to depend on the subject's avoidance of being different. When the subjects were asked to identify themselves by name before reporting their count, they





yielded less often to the influence of overheard reports. McDavid (1959) had similar results with a metronome type task. He reported that subjects were less prone to conform to the supposed group responses when metronome clicks were used than when the attitudinal items were used.

#### XV. EXTINCTION OF LEARNING SET

If the subject continually responds to the trials in the suggested manner, Harlow (1949) found that he should unconsciously continue to do so for some time thereafter until extinction occurs. Jacobs and Campbell (1965) using the autokinetic effect found that judgements on a cultural norm deteriorated as a compromise between the subjects' observations and the group observations when post group judgements were made. Thus when the subject made his judgements in isolation without the pressure of the group, a "pooling" of visual impressions occurred with the norm previously established in the group. Hence, weighting on memory decreases and the relative weighting increases as the number of trials using perceptual judgement increases. Sherif (1956) also noted that the autokinetic effect appeared to operate in a similar fashion even when the subjects were informed



that they were making their decisions in terms of the group norm. These studies suggest that the incorrect judgements would deteriorate once the flow of information was stopped.



## CHAPTER III

### PROJECT PREPARATION

#### I. THE PILOT STUDIES

There were three basic pilot studies conducted prior to the present experiment. The first study was for the purpose of developing the tasks to be used in the experiment and the last two studies were for the purpose of testing the materials and obtaining some indication of the usefulness of the computer in presenting and collecting the necessary data. The basic problems and initial findings are given below.

#### II. DEVELOPMENT OF THE TASK

The first study which was conducted in November, 1968 concerned the development of the task to be used for the experiment. Initially, there was no decision as to the form of stimuli to be presented to the subjects and some work was done before the most suitable stimuli were decided upon. Generally, mixed squares, circles, lines, rectangles and triangles were used in various combinations. Results indicated that a sequential presentation of straight lines using a stimulus and set of alternatives was most useful. The factors considered in the problem with the reasons for the final decisions are given below.



### Number of Exposures

According to Weiss (1964b) the number of exposures to the biased material is related to conformity in that increased exposure results in greater conformity. Although the study used items similar to the Asch and Crutchfield type question, continuous exposure to incorrect items occurred rather than interspersed of correct and incorrect items.

### Individual Trial Time

With simultaneous presentation of stimuli, Luchins (1961) found that the length of time and the distance of the cards with the lines from the subjects affected the answers. As with the Asch technique, the line to be matched was always placed to the left of the alternate set. The greater the distance, the less the number of correct answers obtained by the subjects. For the present study, sequential presentation was used to stop monitoring of answers by the subject. This introduced several problems which do not occur in simultaneous presentation. The guides used for task development are given below.

### Factors in the Presentation of Stimuli

In the pilot study, when the stimuli were presented sequentially, the following factors appeared to affect the difficulty of the task. From three to seven subjects were used and no practice effect appeared with repeated measurements.

Presentation time of first stimulus. The pilot studies indicated that there was some variation in the actual number





of correct answers as the exposure time of the first stimulus was increased from zero to approximately four seconds. For the purposes of the present study the time was set at three seconds as the number of correct answers appeared to level off at this point, even for young children in the lower elementary grades.

Pause between stimuli. When the time interval between stimulus and alternate set increased to about four seconds, correct answers decreased accordingly. As the relationship appeared to be similar in nature to the one noted above, the pause was set at three seconds for the purposes of the present study.

Exposure time of alternate set. The alternate set of stimuli were left exposed while the subject chose an answer. If a correct perceptual answer was obtained, a new question was presented, otherwise a three second pause occurred.

Number of stimuli in alternate set. The difficulty of the problem appeared to depend on the number of stimuli in the alternate set. In the early pilot work, nine lines were used. When this proved too difficult, the number of lines was decreased to eight, seven, six, five, four and finally three. The difficulty appeared to decrease with a decreasing number of lines. For the present study five lines presented the most useful form of problem. Beyond this number, the subjects did not average more than half



correct unless several years of school had been completed.

Distance between lines in alternate set. According to the subject, varying distances between stimuli were confusing. In the experiment proper, the distance between stimuli was fixed at one inch. It appeared that difficulty was somewhat dependent upon the distance separating the lines, with lines closely spaced being easier to judge.

Mixed stimuli in alternate sets. When mixed stimuli comprised the alternate set, the subject reported that the tasks were more difficult. Each question differed in that the first question might be composed of circles, the second of triangles, etc. Each trial was consistent in terms of the form which was chosen. When the forms were mixed within an alternate set the subjects had to pay attention to both form and height, even though only height was of importance in the actual judgement. Young children found it difficult to concentrate on a single factor such as height even though the instructions specified this. Height was also more difficult to judge due to different forms being in the same alternate set in that a circle with a diameter equal to a vertical appeared smaller than the line to the children. In order to simplify the task, vertical lines were chosen as the basic forms.



Position of the answer in the alternate set. Due to the fact that the subject cannot scan all of the matched set at the instant of exposure time, there is a possibility that the position held by the correct answer may affect the possibility of the subject obtaining a correct answer. The problem was examined in the present study, but further examination should be conducted with the eye movement camera to determine if the method of problem attack used by the subject in any way affects the possibility of obtaining a correct answer. Both height and angle of attack should be of interest to the researcher.

Distance of stimuli from subject. For the purposes of this study, the distance of the subject from the film projector was kept at about 18 inches in line with the findings of Luchins (1961) noted earlier.

Common base line for stimuli. When the baseline for the stimuli was not held constant, the task became very difficult. The tasks that were developed for this study thus have a common baseline to facilitate judgement.

Horizontal presentation of first stimulus. If the first stimulus were presented sequentially and horizontally beneath the baseline level difficulty was reduced. Similarly centering the stimulus appeared to reduce difficulty. It is not known precisely how much change in difficulty occurred.



Differences among stimuli lengths. Depending on the method of problem attack, it may be possible that subjects would find short lines easier than long lines to judge, due to the decreasing proportions which exist as line lengths increase with a constant factor. This would be due to the ratio between the lines approaching one to one at long lengths. For the purposes of the present study, the constant distances by which the lines might vary was fixed at three-quarters of an inch. With longer differences, the subjects had a less difficult time in obtaining almost all of the trials correct, and with differences of one-half inch or less the problem became difficult. When the final task was constructed and placed on film, the differences were slightly smaller than three-quarters of an inch.

Other factors. It may be possible that the distance between the correct answer and the simulated answer would affect the subject's response. The problem could be simplified for study if only one simulated answer were used. It is doubtful if any effect occurs.





### III. INITIAL COMPUTER BASED STUDIES

Two initial computer based studies were conducted to eliminate any difficulties which might interfere with the final study. Both dealt primarily with the same problems of reaction time and correct responses, with subjects ranging in age from four to 60 years.

The first study consisted of thirteen persons and indicated that as age increased the number of correct answers increased. The number of correct answers levelled off at about ten years of age in all studies. In both computer and manual presentation no significant differences in results appeared.

In the second study, which was essentially a replication of the first, only ten subjects were used. In both instances the subjects were placed in the control group and no social pressure of any kind was used. Again, the reaction times compared favorably with the first study and indicated that a uniform drop occurred with a subsequent levelling off in time required to answer a given question.



## CHAPTER IV

### METHODS AND PROCEDURES

#### I. THE SAMPLE

The subjects for this experiment were drawn from the Edmonton Public School System, and consisted of a sample of 98 students from the total group of grade eight and nines attending Avalon School. The subjects were randomly assigned to seven groups.

#### II. THE TASK

The task was completed at a single sitting with the subjects being randomly assigned to the group on the basis of the terminal where they sat. The subjects were instructed not to talk about the experiment either during it or after returning to school.

After being seated, the subjects were signed on to the computer program and began reading the instructions for the experiment. After typing in their name and group number, they began the first set of questions. The first question was preceded by a warning to watch the film projector for the first question. The first line was presented for three seconds. The film projector then was darkened for three seconds after which the alternate set was presented on the film projector and the subject



was asked to choose one of the alternate lines. Once the student made an acceptable response, the shutter closed and the student was moved to the next question.

The above sequence continued until the end of the tenth question, when the subject was presented with one of the seven treatment conditions. The subjects who received treatment were given a sample trial showing the form of "aid" that they would receive from the computer. They were then presented with the next question which began with the presentation of the biased material. When the subject finished reading the material, he pressed the space bar to begin viewing the stimuli and alternate set. These were presented in a manner which was identical with the first ten questions except that the biased material remained on the Cathode Ray Tube until he made an appropriate response referring to one of the five possible choices from the set of alternates. If the subject chose the answer which the computer presented in the form of biased material, the film projector was closed and the subject was told that he had done very well. The next question was begun at once and the cycle occurred again. If the subject chose an answer which was not given by the computer, no comments were made. Instead, the screen and the film projector were darkened for three seconds before the next question was presented.



At the end of the treatment, the subject returned to the first ten questions and took them again. These questions will subsequently be referred to as questions 31 to 40. After the subject had completed the 40 questions he was thanked and asked to sign off and complete the attitude questionnaire.

### III. RESEARCH DESIGN

Below is a brief description of each group and the form of treatment given, as well as a graphical description of the design. For all groups, the first ten questions were used for the purpose of simple observation and to determine if the groups were in fact comparable in terms of the number of correct answers and reaction time. The second and third question sets were for treatment, and the last ten for observation.

#### Group 1

This group served as a control group and did not receive any form of biased material to pressure the subjects responses to the questions. Instead, subjects were faced with the task of identifying the line in the alternates without any information regarding the correct answer either before or after the question for the entire 40 questions. (n = 14)





Group 2

This group received only true coaching statements from the computer during the trials 11 to 30. The perceptually correct answers were presented as having been chosen by their peer group as correct. In all of the treatment groups no comment was made when the student chose an answer other than the keyed one. Any drawing of attention to the fact that another choice was made would be perceived as an attack by the subject and confusion as well as possible resistance to further pressure may develop according to Hovland (1949). The feedback was positive and of the form "Very Good John! Let us try the next question." This feedback was used in all of the treatment groups when a subject chose an answer given by the computer. (n = 14)

Group 3

This group received only true coaching statements from the computer. Unlike the second group, the pressure was presented as a direct statement by the computer acting as an authority. The statement was of the form "The correct answer is 4." When the subject agreed with the computer answer, there was reinforcement in the form of the message given group two, while if the subject disagreed, no comment was given. (n = 15)

Group 4

Group four subjects were presented with group pressure



as in the second group. The simulated pressure was used to force the subject's choice of an answer three-quarters of an inch smaller than the correct perceptual answer. (n = 14)

Group 5

In this group, subjects were presented with material in a manner which simulated the computer as an authority. Here, the computer statement attempted to aid the subject in choosing an answer that was three-quarters of an inch smaller than the correct perceptual answer. (n = 12)

Group 6

The subjects were presented with biased material in the form of simulated group pressure, which was intended to encourage them to select an answer three-quarters of an inch larger than the correct one. This answer was supposedly selected by their peer group. (n = 14)

Group 7

Subjects were placed in a position where the computer acted as an authority and attempted to aid them in choosing an answer which was three-quarters of an inch larger than the correct one. The computer supposedly presented the subject with the correct answer to aid him. (n = 14)



#### IV. QUESTION SET CONSTRUCTION

The individual trials were arranged in sets of ten questions. There were four sets of questions which were called one, two, three, four. Set number one consisted of the first ten questions, set two of the second ten questions, set three of the third ten, and set four of the last ten questions.

Within an individual trial there were five possible positions which could contain the correct answer. The perceptually correct answers were placed in each position from one to five throughout each set of ten questions. For further information see the sample question in Appendix I and the table of line positions in Appendix J.

As there was always a line which was three-quarters of an inch larger than the correct answer in an individual trial, these were arranged in a manner identical with that used in arranging the correct answers. Two of each form of answer occurred in each of the five line positions within a question set. Thus, ten correct answers within a question set occurred as two correct answers in each of five positions. A similar arrangement occurred with the smaller and larger answers.



## V. DATA COLLECTION METHODS

The computer program used in the experiment was written in Coursewriter II, and presented 40 questions to the subjects. All student responses were recorded and used in the analysis. The major items of interest were the answers given by the student, the reaction time for each question and the time spent in reading the biased material.

Analysis of the data included analysis of variance on the number of correct answers obtained by the group, on the reaction times for the questions, and on the reading time for the biased material. The simple main effects for factor A was examined for the four levels of factor B. Where significance existed, further analysis was done by means of a Scheffe multiple comparison of sample means. The problem of line position was examined in terms of the first question set by means of a Chi square.

The post experiment questionnaire was also examined and the results were tabulated for each question.

## VI. 1500 COMPUTER PROGRAM

The computer program used with the 1500 system may be obtained as a listing from the Division of Educational Research Services, University of Alberta, Edmonton.





## CHAPTER V

### THE RESULTS

In this chapter, the results of the experiment are presented in two sections. The first section examines the experiment proper, while the second deals with the results of the post attitude questionnaire.

#### I. EXPERIMENTAL

There are three main problems to be examined in this section. These are the number of correct answers obtained, the answer reaction times, and the reading times of the subjects. The effects due to the treatment groups are the 'A' factor and the effects due to the question sets comprise the 'B' factor. When significant interaction occurred, the simple main effects of A were examined. The A effect consisted of the form of pressure used to sway the subject's opinion and the direction in which the perceptual judgement was to be swayed. The B effects were the repeated measures. Four of these were made, the first being a simple baseline measure on all groups for the first question set. The second consisted of reinforcing the treatment given by telling the subject that



he was correct when an answer presented by the computer was chosen. This was also done for the third repeated measure to determine the effects of extended exposure to the reinforcement and to try to obtain a learning set. The last measure was made on the fourth question set and was used to determine whether or not the reinforced answer persisted following withdrawal of reinforcement.

Table I indicates the overall analysis of variance in terms of the number of correct answers obtained by the subjects. Due to the significant interaction effects, the simple main effects of A for the four levels of B were examined.

The simple main effects for A on each of  $b_1$ ,  $b_2$ ,  $b_3$ , and  $b_4$  were calculated by the methods given in Winer on page 311. A plot of the group means is also shown in Figure 1 (page 43), and the results of the analysis of variance are shown in Table II for simple main effects. The probabilities associated with the effects are significant at the .01 level.

In examining the simple main effects of A, only the treatment levels where pressure was presented have significant differences. When no pressure of any form is applied, the group will obtain relatively the same number of correct answers as in the control group.

For the effects of A at  $b_2$  and  $b_3$ , Scheffe multiple



TABLE I

## ANALYSIS OF VARIANCE ON CORRECT ANSWERS

Source	SS	DF	MS	F	P
Between Subjects	1886.816	97			
'A' Main Effects	889.047	6	148.175	13.232	.01
Subj w/ in groups	1019.070	91	11.199		
Within Subjects	1542.000	294			
'B' Main Effects	149.603	3	49.868	14.697	.01
'A * B' Inter	502.411	18	27.912	8.226	.01
'B' Subj w/group	926.297	273	3.393		



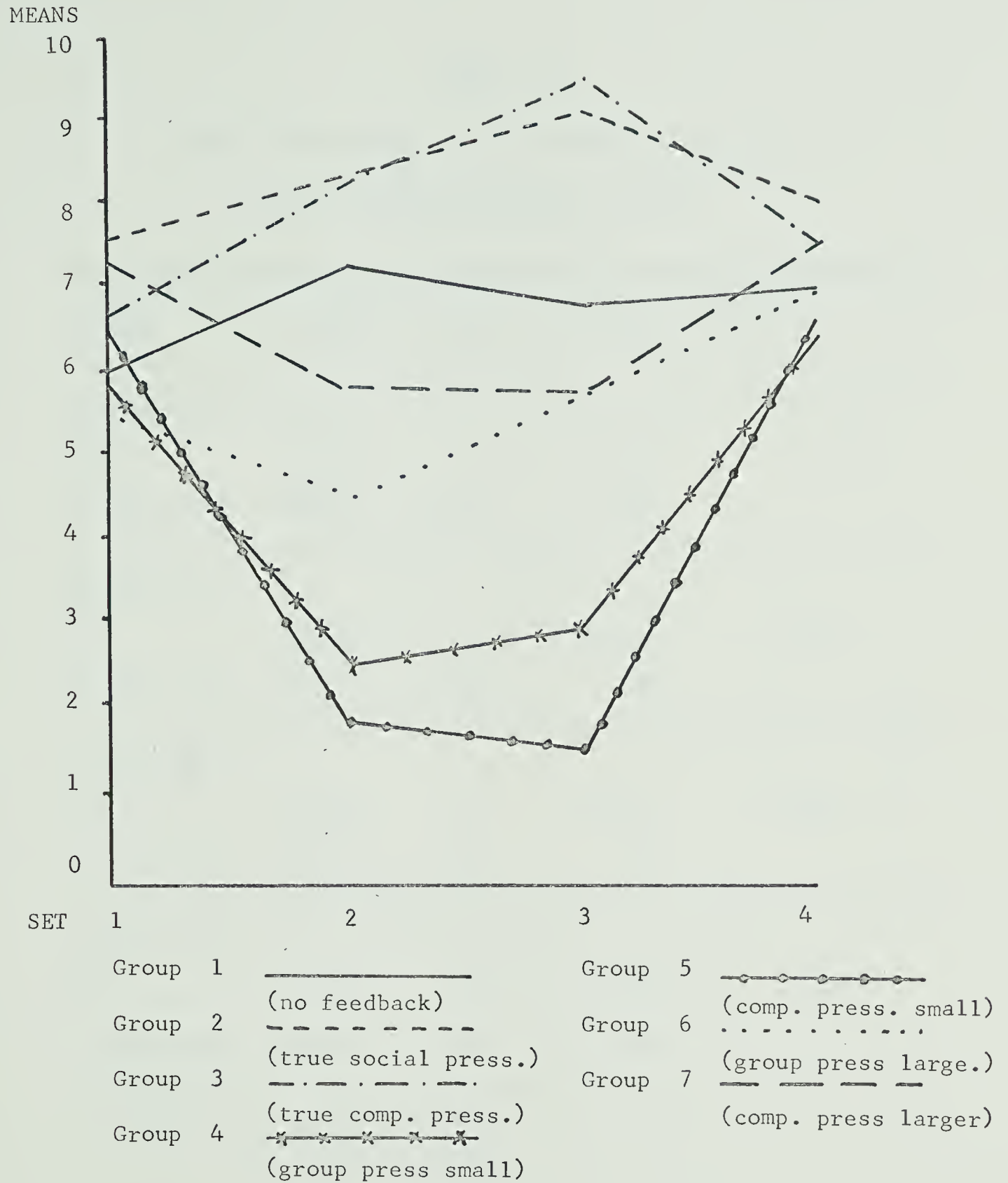


Figure 1

Means of correct answers graphed across the  
question sets





TABLE II

SIMPLE MAIN EFFECTS OF A AT LEVELS  $b_1, b_2, b_3,$   
AND  $b_4$  IN TERMS OF CORRECT ANSWERS

SOURCE	SS	DF	MS	F
Groups for $b_1$	49.56	6	8.26	1.545
Within Cell	1945.37	364	5.34	
Groups for $b_2$	560.45	6	93.47	17.49
Within Cell	1945.37	364	5.34	
Groups for $b_3$	710.90	6	118.48	22.17
Within Cell	1945.37	364	5.34	
Groups for $b_4$	31.05	6	5.08	.97
Within Cell	1945.37	364	5.34	
F Critical .95 (6,364) is	2.10			
.99 (6,364) is	2.80			



TABLE III  
SCHEFFÉ MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR  
A ON LEVEL  $b_2$  IN TERMS OF CORRECT ANSWERS \*\*

GROUP		2	3	4	5	6	7
GROUP	1.	.972	.979	.001	.001	.153	.775
	2.		.999	.001	.001	.006	.145
	3.			.001	.001	.011	.214
	4.				.992	.564	.054
	5.					.184	.007
	6.						.933

\*\* Entries indicate the probability of rejecting a true null hypothesis



TABLE IV  
SCHEFFE MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR  
A ON LEVEL  $b_3$  IN TERMS OF CORRECT ANSWERS \*\*

GROUP		2	3	4	5	6	7
GROUP	1.	.429	.132	.004	.001	.846	.903
	2.		.998	.001	.001	.016	.022
	3.			.001	.001	.001	.002
	4.				.874	.237	.154
	5.					.008	.003
	6.						.999

\*\* Entries indicate the probability of rejecting a true null hypothesis



comparisons were carried out. The associated probability levels concerning the rejection of the null hypothesis are in Tables III and IV. Due to the fact that pressure was exerted to both raise and lower the number of correct answers, valid comparisons concern the probabilities obtained when the groups are compared with the control. Significance was obtained by group four (group pressure with smaller answers) and group five (computer pressure with smaller answers), when compared to the control group.

For the effects of A at  $b_3$ , another Scheffe multiple comparisons test was carried out. Here again, the only groups that obtain significance are groups four and five when compared to the control group. Comparisons should not be made with regard to groups other than the control for the reason noted earlier.

From Figure 1, it is apparent that the correct answers placed as biased material will increase the probability of a correct response, while incorrect answers will decrease the probability of a correct response. This is irrespective of the method by which the material was presented according to Figure 1. Similarly, the figure aids in clarifying the fact that if the answer which is presented is smaller than the correct answer, the subject will apparently accept it as correct with greater ease than if the answer presented is larger than the correct answer.





Some very interesting sidelights appeared in examining the performance recordings. Subjects exposed to the pressure almost invariably either accepted the computer or group answer without alternating to correct answers during the treatment, or else completely rejected the material and chose correct answers. These data refer to the material which is shown in Figure 1. The direction which the subject chose (ie. to yield or resist), occurred within a few questions in almost all cases. Subjects seldom consistently resisted the biased material for the second set of ten questions and then accepted the material for the third set of ten questions. Little alternation occurred in answering. According to the first figure, the subjects accepted the material in groups two, three, four and five, and rejected the material in groups six and seven.

Another interesting sidelight concerns the number of correct answers obtained across the first ten questions. From Figure 2 it would appear that there was no noticeable difference in the number of correct answers chosen by the subjects.

The major finding of this study concerned the apparent ease with which perceptual judgement was swayed when the pressure was used with answers which were smaller than the correct answers. This would appear to be explained



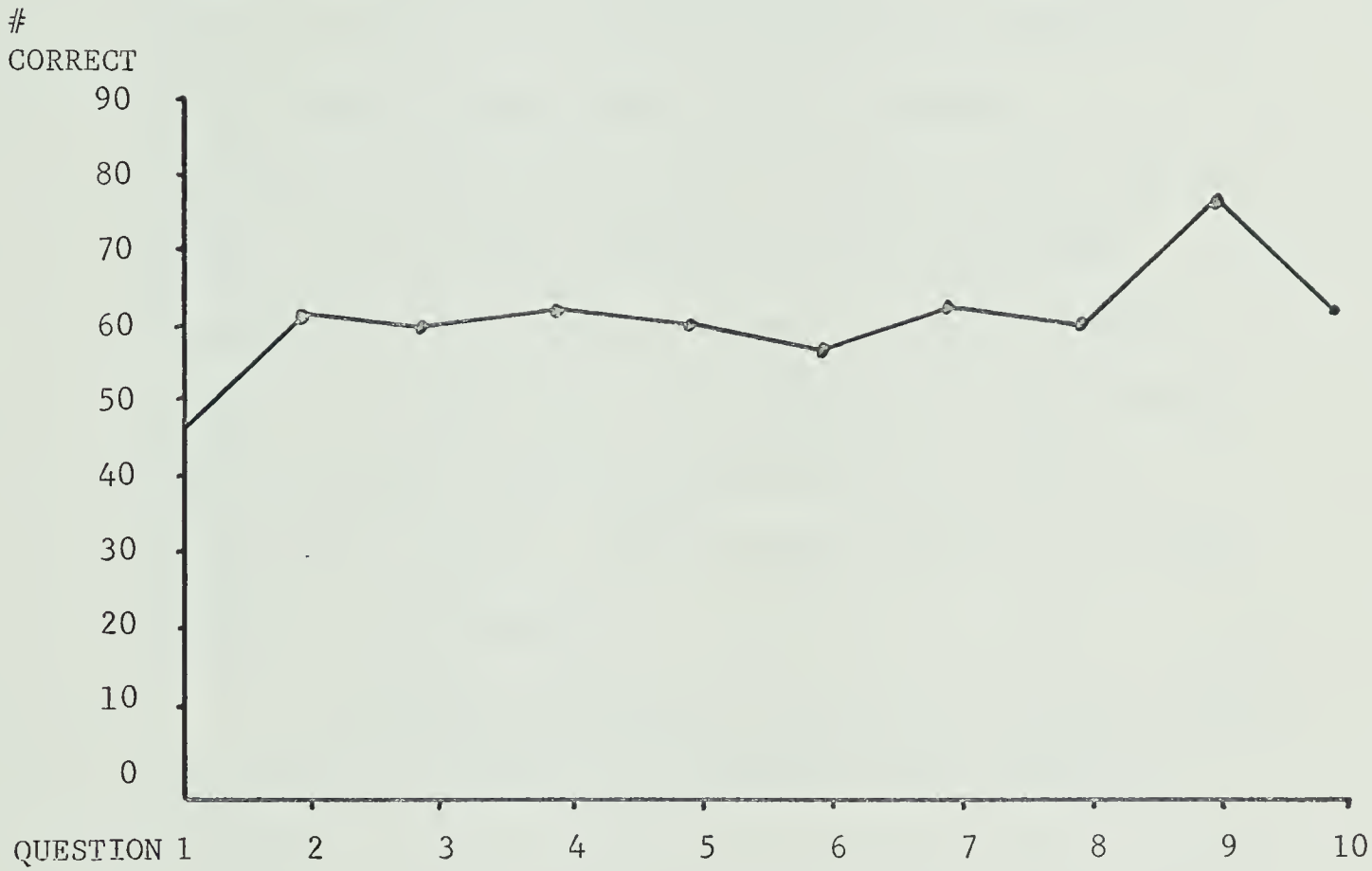


Figure 2

Number of correct answers across all groups for the first ten questions



at least partly by reference to the mean number of incorrect answers chosen by each group which were smaller than the perceptually correct answers in question sets one and four where no pressure was applied. Here, by far the greatest number of incorrect answers were chosen by subjects in groups four, five and six (See Table V). It would also appear to explain why there were significant differences of such magnitude when either group or computer pressure was applied to decrease the size of the answer given. For the fourth question set, the same groups comprised the three highest choosers of smaller answers under normal conditions. This would also aid the apparent lack of success found in pressuring the sixth group to choose larger answers. Their mistakes tended to be toward smaller answers normally.

The groups consistently chose very few larger answers. This occurred in both of the question sets as shown in Table V.

When the answer reaction times were analyzed, the results were as shown in Table VI. As interaction effects were significant at the .01 level, the simple main effects of A for each level of B were extracted. The results are tabulated in Table VII. The only significant F ratio was found to be across the groups on level  $b_2$ . The



TABLE V  
 MEAN NUMBER OF INCORRECT ANSWERS CHOSEN FOR QUESTION SETS  
 ONE AND FOUR

SMALLER SIMULATED ANSWERS				LARGER SIMULATED ANSWERS			
QUESTION SET		1	4			1	4
GROUP	1.	1.72	2.00	GROUP	1.	.93	.43
	2.	1.56	1.22		2.	.50	.64
	3.	1.86	1.60		3.	1.00	.73
	4.	2.70	3.14		4.	.86	.21
	5.	3.09	2.75		5.	.33	.83
	6.	3.85	2.64		6.	.29	.36
	7.	1.60	1.20		7.	.73	1.06





TABLE VI  
ANALYSIS OF VARIANCE ON QUESTION REACTION TIMES

SOURCE	SS	DF	MS	F	P
Between Subjects	91378.625	97			
'A' Main Effects	5348.187	6	891.385	.943	.468
Subj. w/ in groups	85974.125	91	944.771		
Within Subjects	165417.500	294			
'B' Main Effects	45896.262	3	15298.754	41.529	.01
'A * B' Inter.	17268.555	18	959.364	2.604	.01
'B' Subj w/in grp	100570.750	273	368.391		



TABLE VII  
SIMPLE MAIN EFFECTS OF A AT LEVELS  $b_1$ ,  $b_2$ ,  $b_3$ ,  
AND  $b_4$  IN TERMS OF REACTION TIMES

SOURCE	SS	DF	MS	F
Groups for $b_1$	5074.35	6	845.73	1.65
Within Cell	186544.88	364	512.49	
Groups for $b_2$	12584.60	6	2097.43	4.09
Within Cell	186544.88	364	512.49	
Groups for $b_3$	4001.48	6	666.91	1.30
Within Cell	186544.88	364	512.49	
Groups for $b_4$	1285.94	6	214.32	.42
Within Cell	186544.88	364	512.49	
F Critical .95 (6,364) is 2.10				
.99 (6,364) is 2.80				



other levels indicated that there was no difference in reaction times between the groups initially, during the second part of the treatment or during the post or last measurement made by means of the question sets. It would appear that the treatment when initially applied at  $b_2$  had a significant effect on the speed with which the subjects responded.

When a Scheffe test was carried out on A at level  $b_2$ , the results were as found in Table VIII. As Figure 3 also indicates that the application of treatment significantly changed reaction times by raising them when incorrect answers are given and lowering the means when correct answers are given, the most important comparisons which can be profitably drawn concern those in which one of the groups is compared to the control group.

The effect noted above is less noticeable when the exposure to the biased material increased, and when the pressure is removed as in the fourth question set. There is however, no significant difference between the control group and the treatment groups in terms of answer reaction time. Speculation and an examination of Figure 3 indicates that the results would have had higher significance if the subjects comprising groups one and three had not been initially somewhat higher than the other groups. If these



TABLE VIII  
SCHEFFE MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR  
A ON LEVEL  $b_2$  IN TERMS OF REACTION TIME \*\*

GROUP		2	3	4	5	6	7
GROUP	1.	.969	.999	.765	.522	.061	.265
	2.		.910	.997	.965	.456	.849
	3.			.598	.364	.027	.149
	4.				.999	.818	.990
	5.					.972	.999
	6.						.995

\*\* Entries indicate the probability of rejecting the null hypothesis





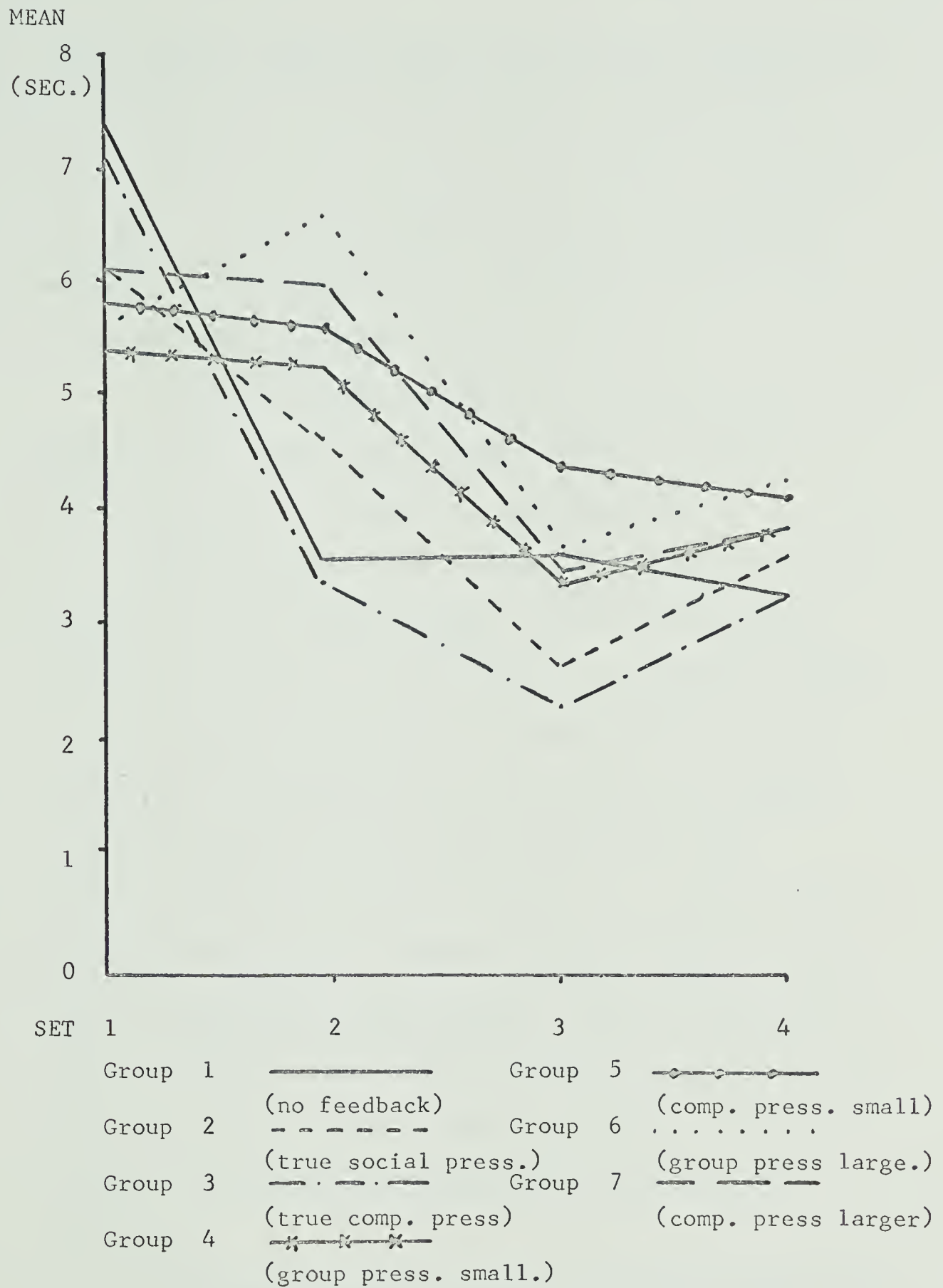


Figure 3

Group reaction time means across the four sets of questions



groups had been lower to begin with and kept a similar rate of decline, the crossover effect which resulted between question sets one and two would not have been so noticeable in Figure 3. There also would have been a corresponding increase in the significance. The general decline of the reaction times is graphed in Figure 4.

In general terms, the pressure, if applied with biased material which was incorrect tended to raise the answer reaction time though not significantly.

The last portion of the analysis concerned the reading times for the biased material. When the interaction effects were found to be significant in the overall analysis, the simple effects for A were calculated. Here, only the second and third question sets were used in the analysis as biased material was used only during these sets. Table IX indicates the overall analysis of variance results which are indicative of differences between groups on the basis of reading the biased material. Due to interaction with the B effect, the simple main effects were calculated. These are given in Table X. For  $b_2$  an F ratio of 7.05 occurred. This indicated that further tests should be carried out.

The Scheffe multiple comparison of means in Table XI substantiated the trend noted in the figures, with the highest significance occurring between the sixth and seventh



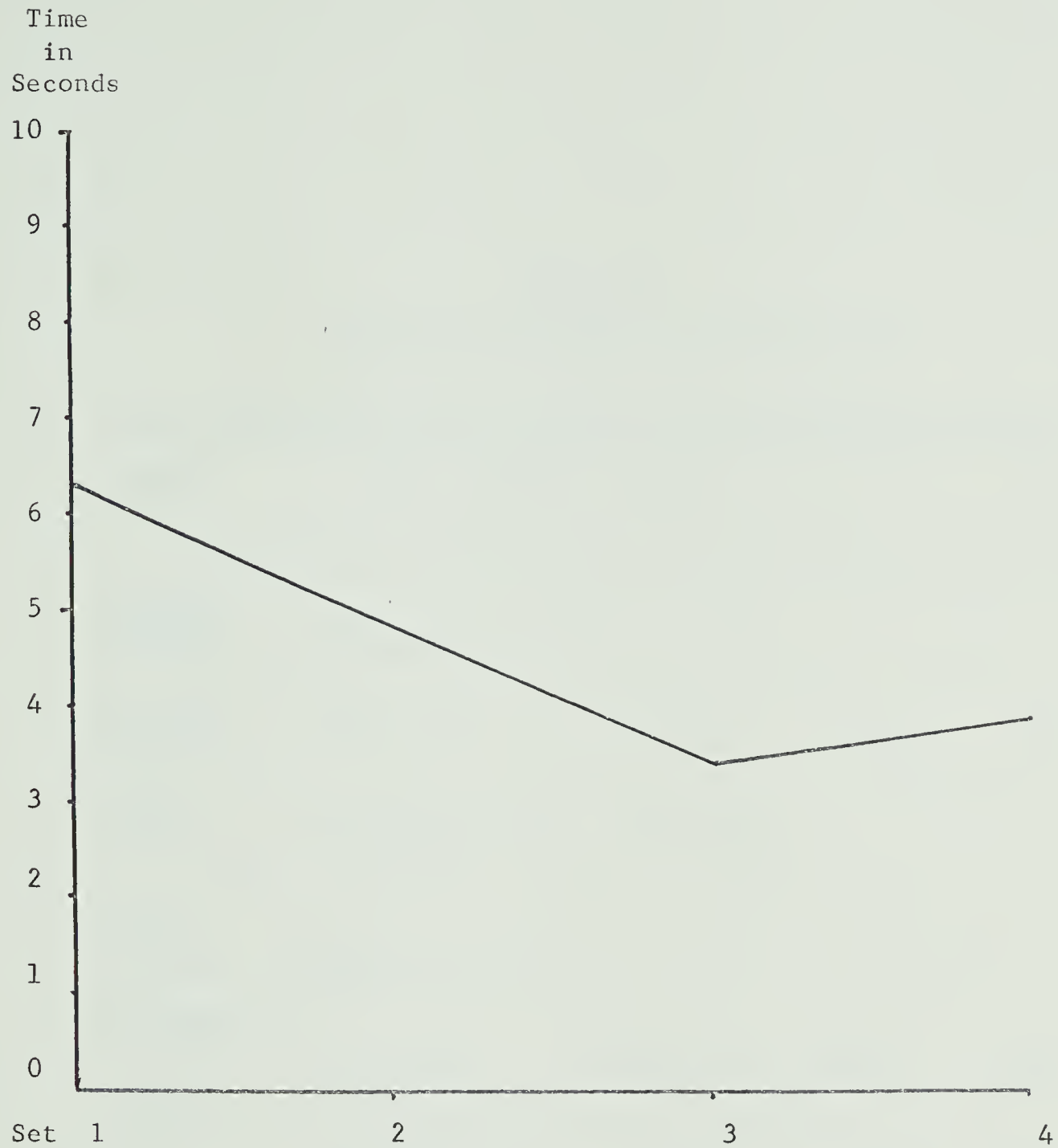


Figure 4

Reaction time means across the forty questions for all groups

(Reading time not included - responses only)



TABLE IX  
ANALYSIS OF VARIANCE ON READING TIMES

SOURCE	SS	DF	MS	F	P
Between Subjects	97655.312	83			
'A' Main Effects	22589.398	5	4517.879	4.755	.01
Sub w/ groups	74116.562	78	950.212		
Within Subjects	108255.437	84			
'B' Main Effects	65174.996	1	65174.996	144.241	.01
'A *B' Inter	7035.094	5	1406.819	3.113	.01
'B' Subj w/groups	35244.250	78	451.849		





TABLE X  
SIMPLE MAIN EFFECTS OF A AT LEVELS  $b_2$  AND  $b_3$   
IN TERMS OF READING TIME

SOURCE	SS	DF	MS	F
Groups for $b_2$	24717.18	5	4943.44	7.05
Within Cell	109360.81	156	701.03	
Groups for $b_3$	5786.03	5	1157.21	1.65
Within Cell	109360.81	156	701.03	
F Critical .95 (5,156) is 2.28				
.99 (5,156) is 3.14				



TABLE XI  
SCHEFFE MULTIPLE COMPARISON OF SAMPLE MEANS FOR FACTOR  
A ON LEVEL  $b_2$  IN TERMS OF READING TIME \*\*

GROUP		3	4	5	6	7
GROUP	2.	.145	.998	.255	.998	.006
	3.		.349	.999	.055	.878
	4.			.501	.965	.026
	5.				.115	.848
	6.					.001

\*\* Entries indicate the probability of rejecting the null hypothesis



groups. Where even group numbers are compared, or where odd numbered groups are compared, the probability of occurrence is very high.

The graphed means varied considerably for the groups with a steady degeneration in reading time as is shown in Figure 5. For a question by question breakdown on the reaction times for each group, see Appendix E, while a rough comparison of computer versus group pressure may be gained by reference to Appendix F. The above indicate that group pressure initially made subjects slower. This would probably be a function of the amount of material which had to be read, as the group pressure material required more reading to extract the same amount of information. Appendix A contains the format of the simulated group pressure and the computer as authority form of pressure.

Significant differences were obtained only between the even (group pressure) and odd (computer pressure) groups, and as noted earlier, differences are probably due to the amount of material which had to be read. It is possible that the difference was due to the form of pressure but because of the material presented varying in reading time, this conclusion cannot be drawn without reservations.

When the problem of line position was tested against



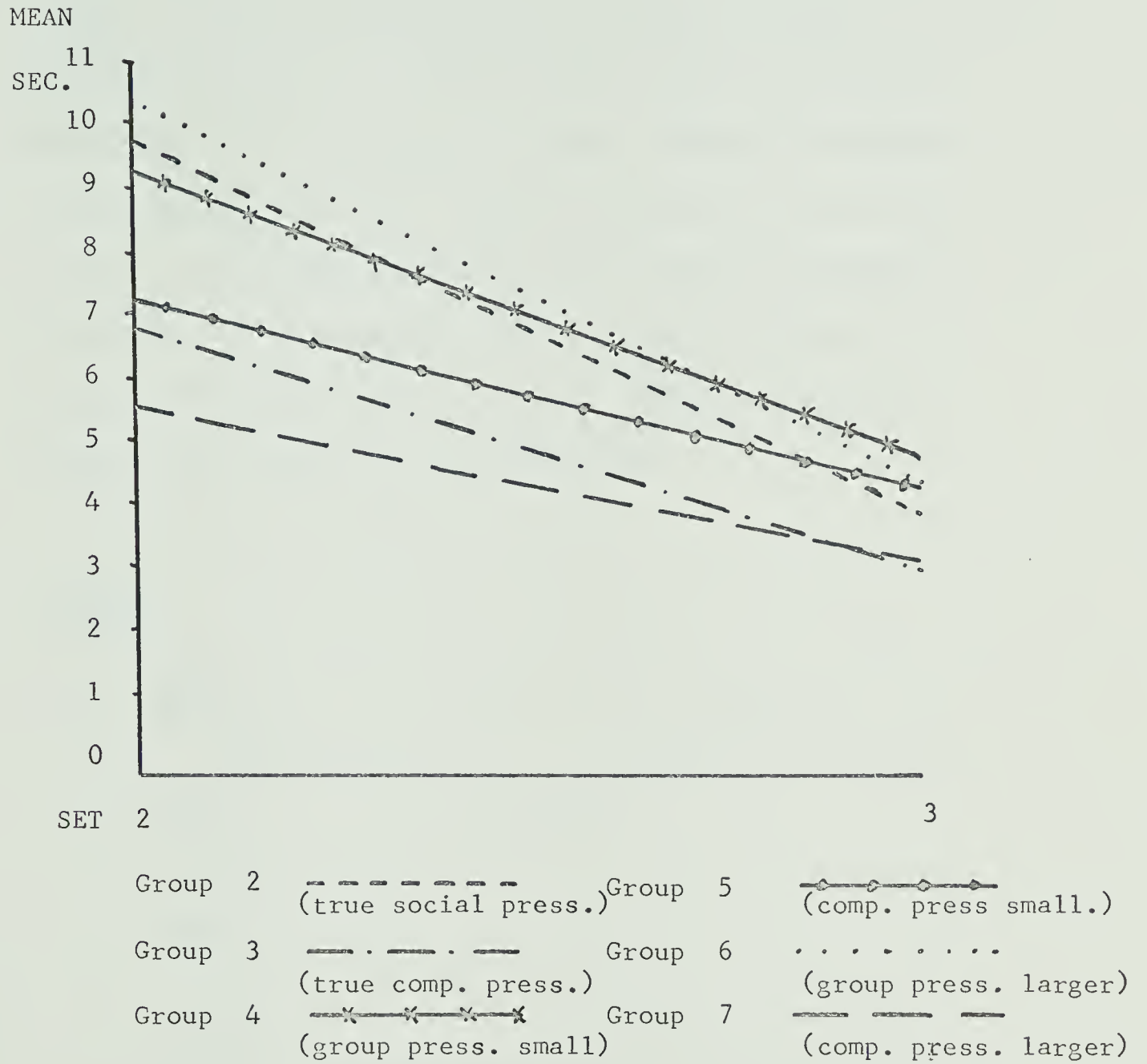


Figure 5

Group means for reading times of biased material in seconds





the null hypothesis of equal distribution by means of the Chi square, the results were not significant, indicating that the position of the line had little to do with the number of correct answers that the subjects obtained. The actual figure was 5.777 with four degrees of freedom. This allowed a probability of between .30 and .20 according to Siegal, page 289. The first question set only was used to eliminate the problems which would arise through the effects of treatments if other question sets were used. The actual number of correct answers are given in Figure 6 for each of the line positions.

Correct  
Answers

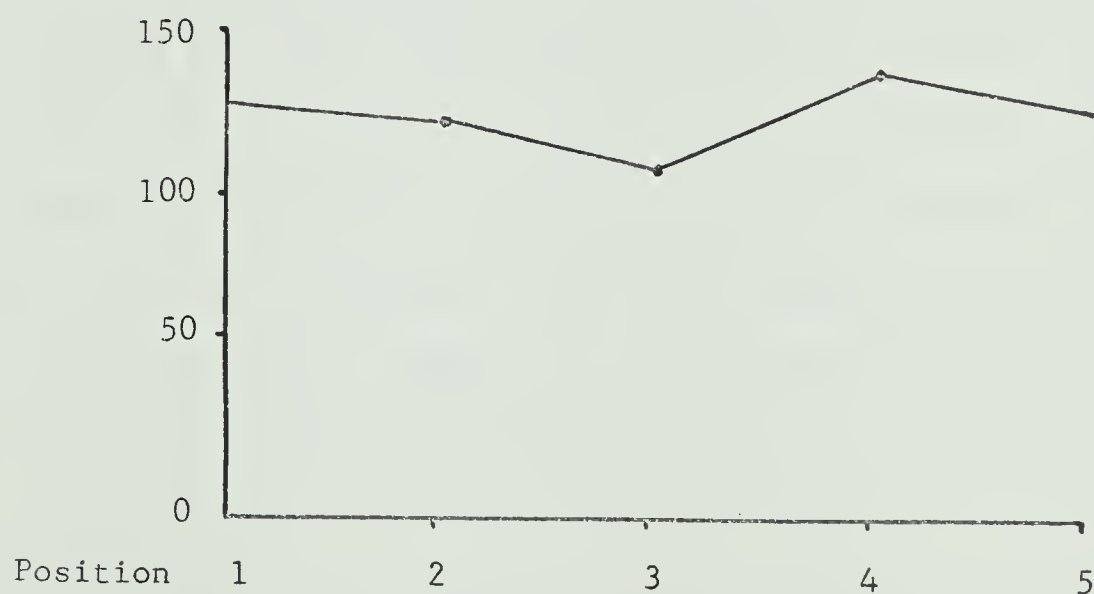


Figure 6

Correct answers across line positions for all subjects (total)  
(first ten questions only)



## II. POST ATTITUDE QUESTIONNAIRE

The last part of the analysis concerns the questionnaire which was administered after the subjects had completed the computer program. A sample of the questionnaire is contained in Appendix G.

The questionnaire asked the subjects to indicate by choosing a number from one to five, their opinion regarding a given question. The number one indicated that they had a positive attitude and the number five indicated that they had a negative attitude. The numbers two, three, and four were alternates which indicated a less strongly held attitude.

The first question concerned whether the subject would like to try again. Here almost unanimity occurred. Only twelve persons did not choose one. This indicates a favorable attitude toward the program even when incorrect biased material was presented. The subjects appeared to be highly interested in the computer and the program which it presented. Only about twenty subjects had previously used the 1500 system at all.

The second question asked the subject to state whether he wished the computer to give answers. Here, the subjects were less unanimous. While the attitude was slightly more favorable than negative, a general split was found to exist.



TABLE XII

## CHOICES ON POST ATTITUDE QUESTIONNAIRE

QUESTION 1: I would like ..... would not like to try again.\*\*

RANK		1	2	3	4	5
Group	1.	13	0	0	0	1
	2.	9	2	0	0	2
	3.	13	0	1	0	0
	4.	12	0	2	0	0
	5.	11	1	1	0	0
	6.	12	1	0	0	1
	7.	12	0	0	2	0

QUESTION 2: I would prefer the computer to give .. not give answers.

RANK		1	2	3	4	5
Group	1.	10	0	1	0	3
	2.	4	0	4	1	4
	3.	2	0	6	0	5
	4.	6	1	3	1	3
	5.	5	1	1	1	5
	6.	8	2	0	0	4
	7.	4	1	3	0	6

\*\* The subject was required to choose one if he agreed with the left hand side of the question and five if he preferred the right hand statement with two, three and four as alternatives if his opinions were not vehement.



Even in those groups which were given correct answers, a split occurred and no general consensus could be reached. In the case of group one, the general indication was that the students would prefer the computer to give answers. This is probably due to the novelty of the situation, as in treatment groups written comments were unfavorable.

The third question concerned practice and if the subject thought that more of said practice would aid his score. Here, the majority indicated that practice would help. Some of the comments indicated that the students interpreted the question as meaning general practice, and stated that practice always helps. The groups appeared to be in general agreement on this and the question appeared to have been interpreted in a philosophical manner.

The fourth question asked the student whether he liked or disliked the computer program. The results were similar to the first question with an overwhelming majority stating that they enjoyed it by choosing a one.

Question five asked the students if they would like to take their school lessons this way. Again the overwhelming majority chose one as their answer. There did not appear to be a great deal of difference between the groups in this respect. Presumably the students meant that they would like the computer to supplement the school work but a large number





QUESTION 3: I think that practice would help .. would not help my score.

RANK		1	2	3	4	5
Group	1.	10	1	0	0	3
	2.	8	2	2	0	1
	3.	8	2	1	1	0
	4.	8	1	1	0	4
	5.	9	1	1	1	1
	6.	12	1	0	0	1
	7.	8	2	1	1	2

QUESTION 4: I liked ..... disliked the computer program.

RANK		1	2	3	4	5
Group	1.	12	0	0	1	1
	2.	10	2	1	0	0
	3.	10	3	0	0	1
	4.	11	1	1	0	0
	5.	10	1	1	0	1
	6.	13	1	0	0	0
	7.	9	2	1	1	1



clearly stated that they preferred the computer because it did not become angry with them if they made a mistake, because it had patience, always had the correct answers, gave them help, was unbiased etc.

The sixth question asked the students if they thought that the program needed improvement. Here a split occurred with about half stating that it needed improvement and half stating that it did not need improvement. Interestingly enough, the students who thought improvement was needed often listed as a reason the rather philosophical statement that everything needs improvement, the implication being that nothing is perfect, and room for improvement always exists.

Question seven dealt with whether or not the computer aided the students score. Most of the students believed that their score was aided by the computer, but some stated that the computer gave the wrong answers. Only two or three students openly made this comment in writing. Subjects receiving group pressure disagreed with the statement with greater frequency.

Question eight asked the students if they would like to know how well they did. There were only six who did not express their interest by choosing one. One student stated that as the problem did not concern schoolwork directly he did not care. In order to clarify the purpose and direction of



QUESTION 5: I would like ..... would not like to take my school lessons this way.

RANK		1	2	3	4	5
Group	1.	12	0	0	1	1
	2.	9	1	0	1	2
	3.	11	0	2	0	1
	4.	10	0	1	1	2
	5.	10	3	0	0	0
	6.	11	2	0	0	1
	7.	11	1	2	0	0

QUESTION 6: I think the questions in the program need ..... do not need improvement.

RANK		1	2	3	4	5
Group	1.	3	0	1	0	9
	2.	4	0	3	1	5
	3.	4	5	1	1	3
	4.	6	2	3	0	3
	5.	4	3	2	1	3
	6.	3	2	0	0	9
	7.	5	2	4	0	3



TABLE XV

QUESTION 7: I think the computer helped .... did not help my score.

RANK		1	2	3	4	5
Group	1.	9	2	2	0	0
	2.	6	1	1	0	5
	3.	10	1	1	1	1
	4.	6	1	3	0	4
	5.	10	0	1	0	2
	6.	8	1	0	0	5
	7.	6	2	3	1	2

QUESTION 8: I would like to know .... would not like to know how well I did.

RANK		1	2	3	4	5
Group	1.	12	1	0	0	1
	2.	11	1	1	0	0
	3.	14	0	0	0	0
	4.	14	0	0	0	0
	5.	13	0	0	0	0
	6.	13	1	0	0	0
	7.	13	0	0	0	1





the experiment, a two page letter was sent to the teacher who aided in organizing the students for the study for distribution to the students. This explained in a general form the purpose of the experiment and gave the student some idea of the form of pressure he was exposed to as well as the general results of the experiment. A sample copy of the letter is included in Appendix L.

Question nine asked the subject if they agreed with the answers the computer gave. For the first five groups, the general consensus was positive. However, in the case of groups six and seven, an ambivalent attitude occurred. Here again students stated that the answers were incorrect. About five or six students made this comment under the question.

The last question concerned whether or not the student could judge lines any better now. The majority of the students stated that they thought they could. A fair percentage was ambivalent however. In terms of the actual correct responses the means for the groups were generally slightly higher.

Subjects were asked to write any comments that they had concerning the experiment on the back of the sheet. Only a small percentage made use of this option, probably due to the short time allowed for reasons due to transit. Most of the comments dealt with the satisfaction the students felt regarding the opportunity to use the computer and



QUESTION 9 : I agree ..... disagree with the answers the computer gave.

RANK		1	2	3	4	5
Group	1.	8	0	3	0	1
	2.	8	1	2	1	1
	3.	10	1	2	0	1
	4.	7	2	4	0	1
	5.	7	2	3	1	0
	6.	6	0	1	1	6
	7.	2	3	3	1	5

QUESTION 10 : I think I can ..... cannot judge lines better now.

RANK		1	2	3	4	5
Group	1.	11	1	0	2	0
	2.	7	1	5	0	0
	3.	6	2	4	0	2
	4.	8	1	4	0	1
	5.	8	3	1	0	1
	6.	12	2	0	0	0
	7.	7	2	5	0	0



thanking the computer for supplying them with an interesting experience. It did not appear that the students were aware of the duplicity inherent in the experiment and they gave no indication of disapproval in any general sense, other than the few comments noted. The general attitude toward CAI was highly favorable. Whether this was due to the novelty effect of the computer, or whether this is a lasting phenomena will no doubt become evident in the future.



## CHAPTER VI

### FINDINGS AND IMPLICATIONS FOR FUTURE RESEARCH

The major problem of this experiment was to place an individual in a situation in which either his peer group or the computer appeared to disagree with him in a simple vertical line judgement situation. Measurement involved the number of correct answers, reaction times to questions, reading times for biased material and a post attitude questionnaire.

#### I. FINDINGS

Hypothesis one. No significant differences exist in terms of response time for the groups across the forty questions. (Rejected)

Hypothesis two. There is no significant difference in terms of reading response time between the second set of ten treatment questions and the third set of ten treatment questions. (Between groups) (Rejected for the second set, accepted for the third set)

Hypothesis three. There is no significant difference in terms of the number of perceptually correct answers for the groups across the four sets of questions. (Accepted for the first set, rejected for the second and third sets and accepted for the fourth set)





Hypothesis four. There is no significant difference in the number of correct answers chosen on the basis of line position. (Accepted)

## II. DISCUSSION

The findings indicate that the major objectives of the study were achieved. It is possible to use the computer to simulate the Asch-Crutchfield form of experiment in social pressure.

The most significant finding concerned the apparent ease with which subjects could be swayed to choose smaller answers. However, when errors occurred under conditions of no pressure, there was a tendency to err in the direction of choosing a smaller answer. The question arises as to whether there was bias in the sample or if this represents some form of perceptual effect independent of treatment. There should have been no difference in the number of answers chosen as all answers differed from their nearest match by three-quarters of an inch. This was not dependent on line position. One factor which may have been of importance was the overall height of the lines in that smaller lines retain a greater proportional difference than larger lines. This was not examined, but forms a possibility. Another factor may be the method by which the subject attacks the problem visually. Probably the best answer to the question would involve a cross validation of the study with each group being drawn from a different school, rather than one school.



The second major problem dealt with the reaction times which do not appear to have been considered in research within this field to date. Several problems emerge. First, variations across the curves which were graphed appeared to be due to variations of individuals rather than the group as a whole. Often an apparent increase in a curve which was essentially flattening out was due to some extreme time on the part of one of the individuals in the group. This had the effect of drawing the mean for the group upwards, and occurred several times throughout the experiment.

Another point which might be considered is the sudden change in reaction times when the biased material was presented. The increase only occurred for the treatment groups and would lead one to speculate that the subjects were considering the material prior to making a decision.

### III. IMPLICATIONS

The major implication of this study is that the Asch-Crutchfield form of experiment can be replicated by computer with a resultant increase in the possible measures as well as the control which is exercised by the experimenter. By presenting identical material to the subjects, the experimenter reduces the risk of differing information reaching subjects. Similarly, the pressure exerted by a group of people upon a



subject may vary as personalities are involved. No such problem exists when the computer is used. In the group situation, reaction time cannot be measured accurately and material cannot be presented in a rigid manner. The computer makes possible these measurements and manners of presentation.

Another question concerns the moral and ethical implications of the study. Incorrect programming can at least temporarily change perceptions. What might occur if extended periods of such programming were used? Can the technique be strengthened and effects be prolonged by reinforcement and punishment schedules? Can incorrect attitudes be fixated and changed by appropriate programming with propaganda and reinforcement? Is there a perceptual effect which causes persons to choose smaller answers rather than larger answers, and if so, why? It must be remembered that the program allows a fixed basis which may be added to and improved. Can one control unconscious processes by means of conscious reinforcement? Reference is not made to the processes controlled by the autonomic nervous system but to the psychological processes by which one learns and remembers. Can attitudes be implanted for increasing the speed with which a subject will accept new concepts and integrate these into existing schemata? Can learning processes be adequately defined in physiological terms? Such questions may well be



of interest in the future, but again, what is the moral and ethical right which allows programmed control of humans? Clearly a balance is necessary, or the Orwellian world of 1984 may be a greater reality than supposed. Disorders may well be treated by "straightening" out the cognitive processes to conform with accepted beliefs and attitudes. Unfortunately many ideas leave the laboratory before the implications are understood. Probably a more realistic attitude would simply be that it all depends on how the ideas and knowledge gained is used, and as long as compulsion does not enter the picture no problem exists, especially if opposing views are tolerated and permitted.





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A P P E N D I X     A

METHODS OF PRESSURING SUBJECTS AND QUESTION



### Simulated Group Pressure

QUESTION 11:

7 of your friends have answered this question. Their choices are as shown.

0 chose the answer 1

7 chose the answer 2

0 chose the answer 3

0 chose the answer 4

0 chose the answer 5

### Computer as Authority Pressure

QUESTION 11:

The correct answer is 2

### Presentation of the Question

QUESTION 11:

The answer is:

Note that all of the above were displayed by means of the Cathode Ray Tube, with the question being presented with one of the forms of pressure during the treatment period.





## A P P E N D I X      B

### CORRECT ANSWER AND REACTION TIME MEAN TABLES



TABLE XVII

MEAN CORRECT ANSWERS FOR ALL GROUPS ACROSS ALL QUESTION SETS

QUESTION SET #		1	2	3	4
Group	1.	6.071	7.286	6.929	7.143
	2.	7.500	8.429	9.071	8.000
	3.	6.867	8.200	9.667	7.600
	4.	5.929	2.643	3.000	6.286
	5.	6.500	1.833	1.583	6.583
	6.	5.429	4.571	5.500	6.929
	7.	7.333	5.733	5.667	7.600



TABLE XVIII

REACTION TIME MEANS FOR ALL GROUPS ACROSS THE FOUR SETS OF  
QUESTIONS \*\*

QUESTION SET #	1	2	3	4
Group 1.	74.650	37.421	37.671	33.743
2.	61.514	47.243	28.843	36.257
3.	70.600	35.127	23.513	33.373
4.	53.450	53.178	34.914	39.829
5.	58.642	57.725	45.117	42.425
6.	55.643	67.779	38.278	42.878
7.	61.140	60.927	36.307	39.987

\*\* To obtain the mean reaction time per question in each  
set of ten, divide by ten. All times are in seconds.



TABLE XIX

MEAN REACTION TIMES FOR THE FIRST TEN QUESTIONS

ACROSS GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 1.	13.4	5.9	4.5	3.2	2.9	3.9	2.8	2.8	2.0	2.2
2.	11.0	5.1	3.6	4.6	4.4	4.0	3.2	2.4	2.2	3.3
3.	10.9	7.2	9.7	2.6	2.8	2.6	3.8	2.1	1.7	2.0
4.	9.8	4.9	3.3	2.8	3.2	3.5	2.6	2.5	2.3	2.4
5.	13.0	6.6	3.9	2.9	3.0	4.8	3.2	1.8	5.2	1.7
6.	8.5	5.4	3.9	3.8	2.8	3.4	2.9	4.5	2.0	2.1
7.	12.4	5.3	3.7	3.4	3.1	3.0	2.3	2.2	1.8	3.2

\*\* All times are in seconds.





TABLE XX

ANSWER REACTION TIMES FOR THE SECOND TEN QUESTIONS  
ACROSS GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 1.	4.0	4.3	4.2	4.3	3.9	2.5	4.4	3.5	3.4	2.5
2.	9.8	5.6	3.9	3.7	2.8	5.1	3.8	5.6	3.2	3.3
3.	7.0	3.3	3.9	3.3	2.5	4.5	2.5	3.0	2.6	2.2
4.	10.4	4.2	6.3	5.0	4.4	3.7	4.5	4.9	5.8	3.8
5.	17.2	7.1	4.5	4.4	3.8	6.3	4.4	2.6	4.0	3.5
6.	16.0	7.8	6.2	8.1	6.4	6.5	5.8	6.0	5.0	4.0
7.	13.2	6.3	4.9	6.1	6.2	4.6	7.0	3.9	4.3	4.4

\*\* All times are in seconds.



TABLE XXI

MEAN REACTION TIMES FOR THE THIRD QUESTION SET  
ACROSS THE GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 1.	3.9	3.4	5.6	4.3	5.3	2.4	3.8	3.1	3.5	2.0
2.	2.5	2.9	2.7	3.7	2.5	2.8	2.9	2.9	3.3	2.5
3.	2.6	2.4	2.2	2.3	2.4	2.2	2.5	2.1	2.3	2.5
4.	2.8	2.7	4.1	3.8	3.0	4.2	2.8	3.5	4.8	3.3
5.	3.2	4.5	4.1	3.8	6.5	4.6	4.5	4.1	4.9	5.0
6.	4.5	4.5	4.3	4.2	3.3	3.7	3.4	3.0	4.0	3.3
7.	4.2	3.3	3.4	3.8	2.9	3.6	3.3	3.2	4.4	3.9

\*\* All times are in seconds.



TABLE XXII

MEAN REACTION TIMES FOR THE FOURTH QUESTION  
SET ACROSS GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 1.	3.8	3.4	2.7	2.9	3.6	4.0	2.9	4.2	4.0	3.7
2.	3.6	2.8	3.2	2.9	2.5	2.8	2.5	2.9	2.3	2.8
3.	2.6	2.1	2.9	2.7	2.4	3.2	2.8	2.6	2.0	2.3
4.	3.7	4.5	3.4	2.8	3.3	5.3	2.8	4.0	2.2	2.3
5.	4.2	3.7	3.3	2.9	2.5	3.3	2.5	4.5	3.1	4.0
6.	3.7	2.5	2.9	5.8	3.1	4.0	3.3	3.7	2.2	3.9
7.	3.9	4.0	2.9	3.9	3.1	3.7	2.8	2.8	2.8	3.0

\*\* All times are in seconds.



A P P E N D I X      C  
READING TIME MEAN TABLES





TABLE XXIII

GROUP MEANS FOR READING TIMES OF BIASED MATERIAL (SECONDS)

QUESTION SET #	2	3
Group 2.	98.428	41.286
3.	69.793	32.080
4.	93.228	54.578
5.	71.425	46.908
6.	103.014	48.179
7.	56.947	32.793

\*\* To obtain the mean reading time per question, divide the  
above figures by ten.



TABLE XXIV

MEAN READING TIMES FOR THE SECOND TEN QUESTIONS

ACROSS GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 2.	32.4	13.7	7.6	9.2	7.4	6.0	5.0	8.6	4.5	4.6
3.	22.6	7.9	9.0	7.1	4.4	4.0	3.9	2.9	3.8	4.1
4.	26.9	11.3	8.4	7.4	7.2	6.9	6.1	5.7	6.9	6.2
5.	24.0	8.2	6.7	5.2	5.8	6.1	6.7	3.0	2.7	3.1
6.	15.6	13.3	11.0	11.1	8.8	7.3	7.9	7.2	9.5	7.1
7.	15.5	5.9	7.2	3.1	5.6	3.1	3.8	3.6	4.4	4.5

\*\* All times are in seconds.



TABLE XXV

READING TIME MEANS FOR THE THIRD QUESTION

SET ACROSS GROUPS \*\*

Qu.	1	2	3	4	5	6	7	8	9	10
Gr. 2.	5.2	5.7	3.7	4.2	4.0	3.0	5.5	3.2	2.8	4.2
3.	3.8	4.5	3.4	2.6	3.4	3.1	2.4	2.6	3.5	2.7
4.	6.5	5.8	4.9	5.4	4.6	4.9	5.0	4.0	4.8	5.7
5.	4.6	3.1	3.3	6.6	8.3	5.4	5.0	3.0	4.9	2.7
6.	5.8	5.3	3.6	5.9	5.2	4.9	3.5	4.4	4.0	5.8
7.	2.7	3.2	5.2	2.4	3.7	1.7	3.6	2.8	3.6	4.1

\*\* All times are in seconds.



A P P E N D I X     D  
GRAPHED REACTION TIME MEANS





Seconds

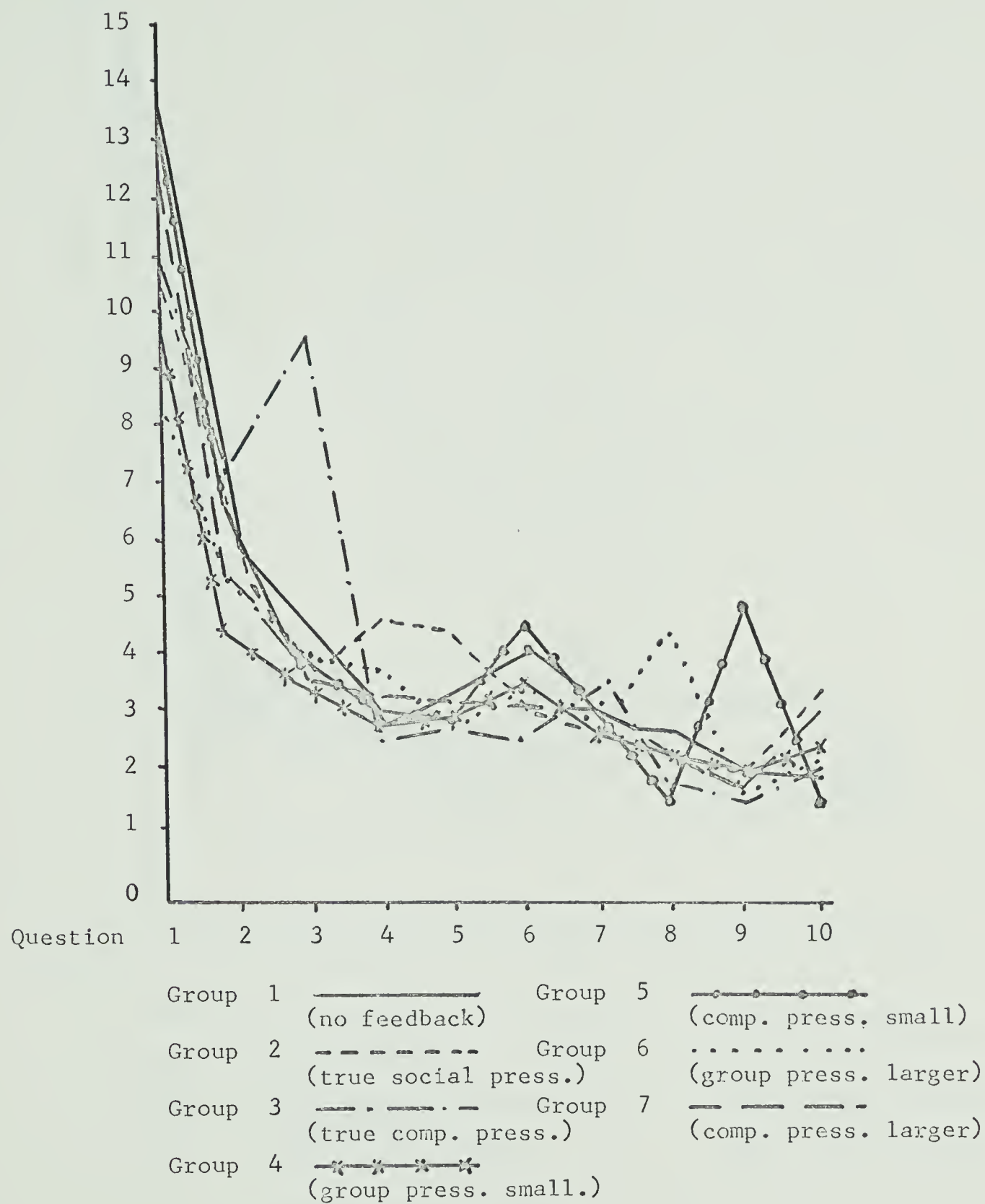


Figure 7

Group reaction time means across the first ten questions



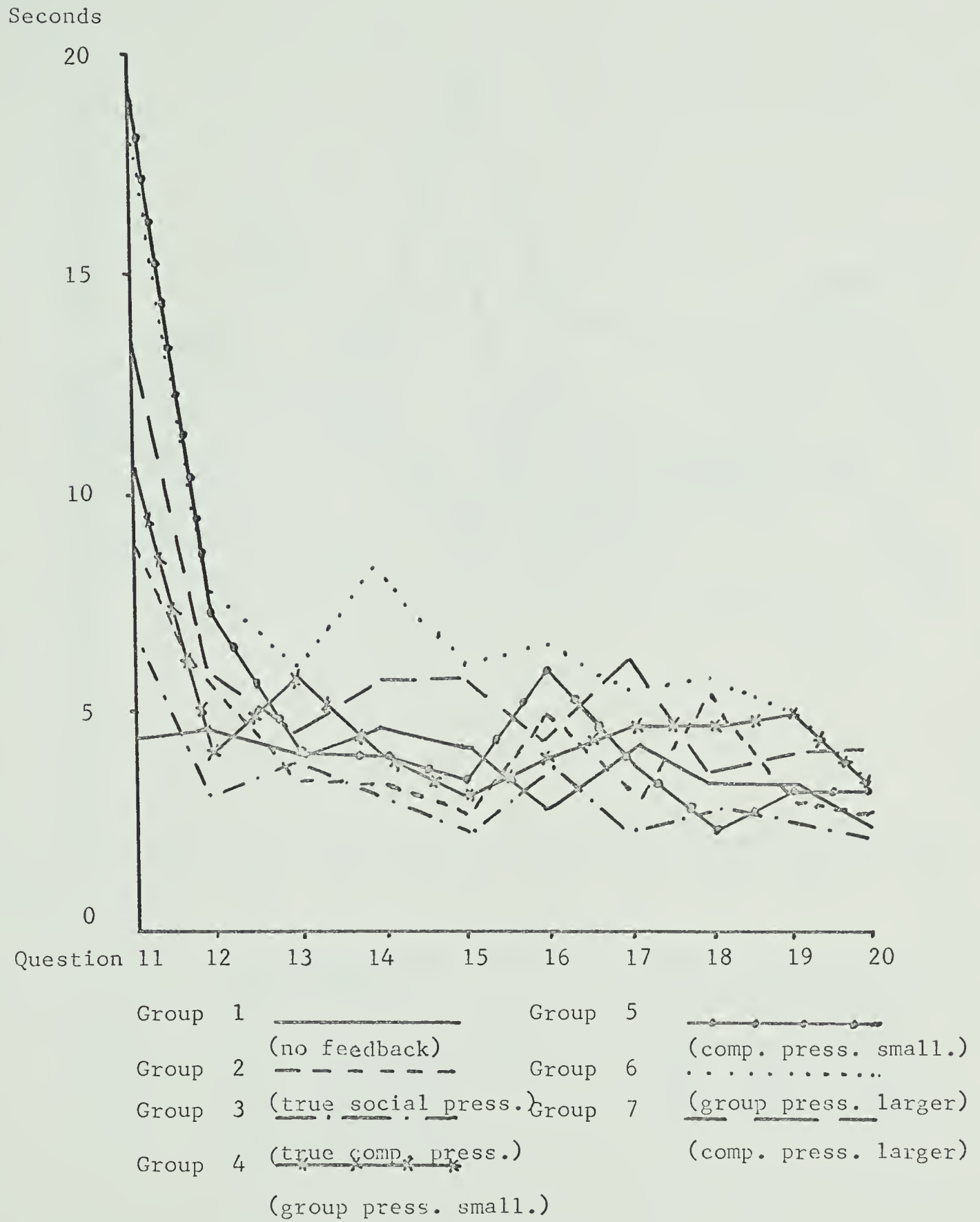


Figure 8

Group reaction time means across the second ten questions



Seconds

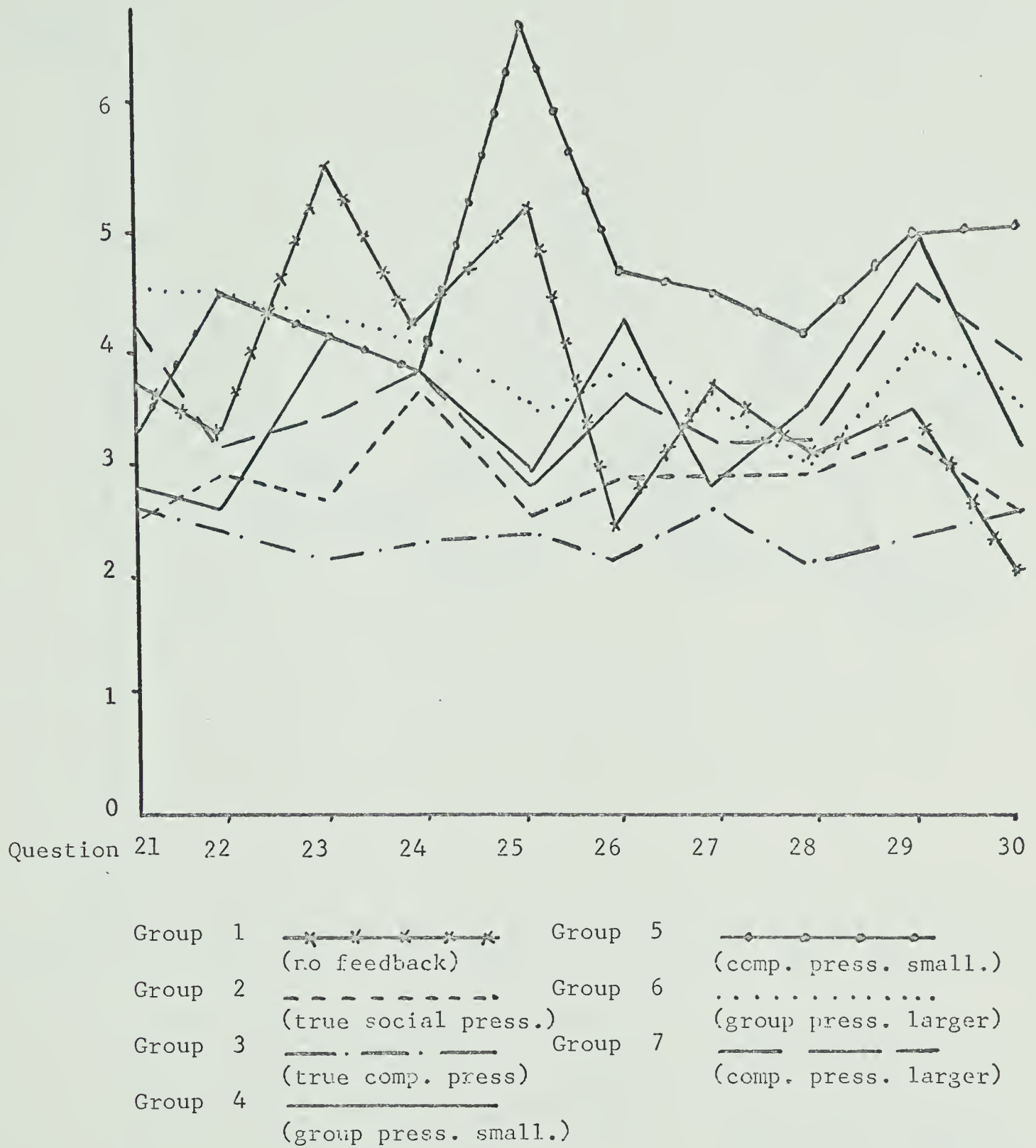


Figure 9

Mean reaction times for the third question set across the groups

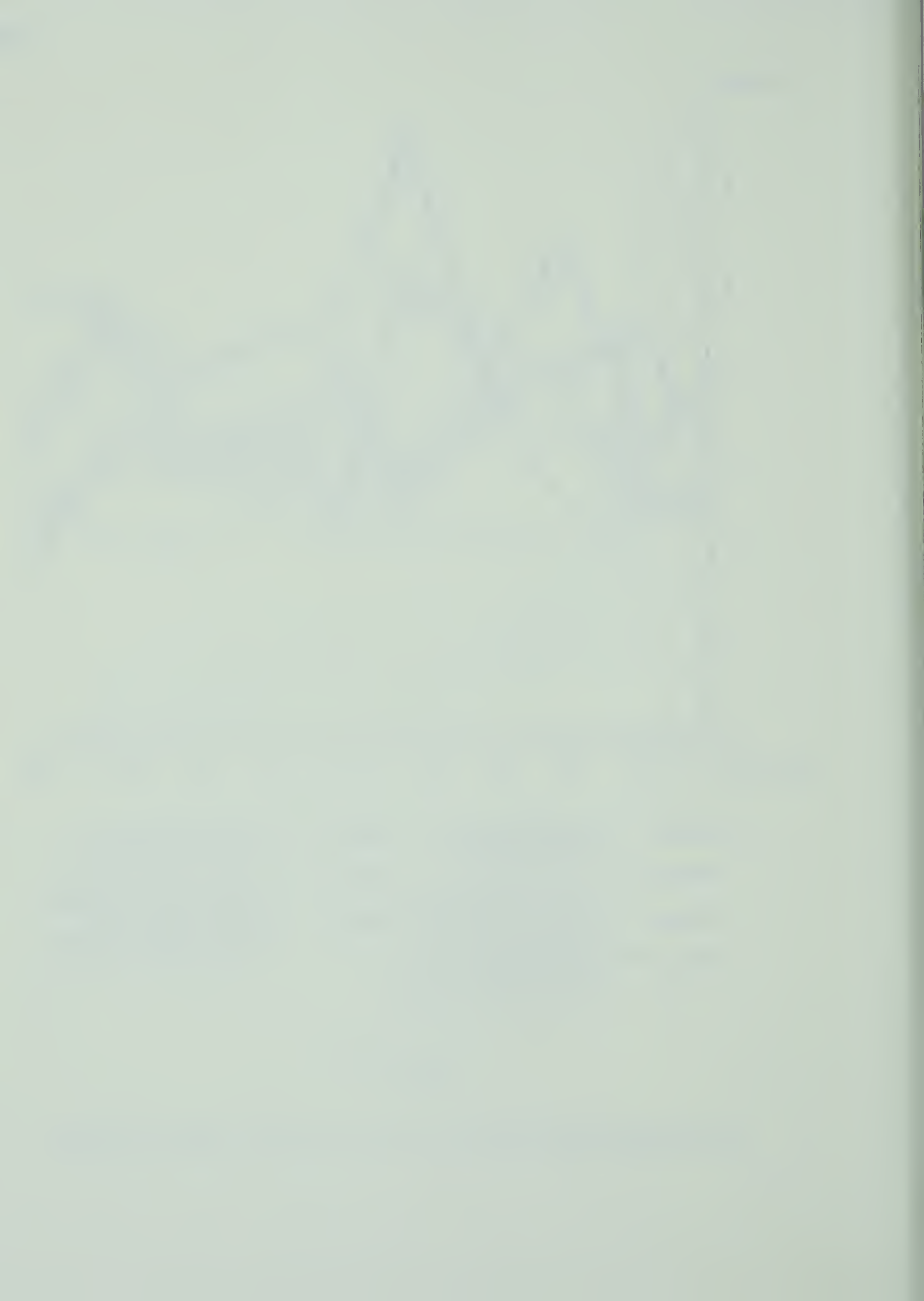




Figure 10

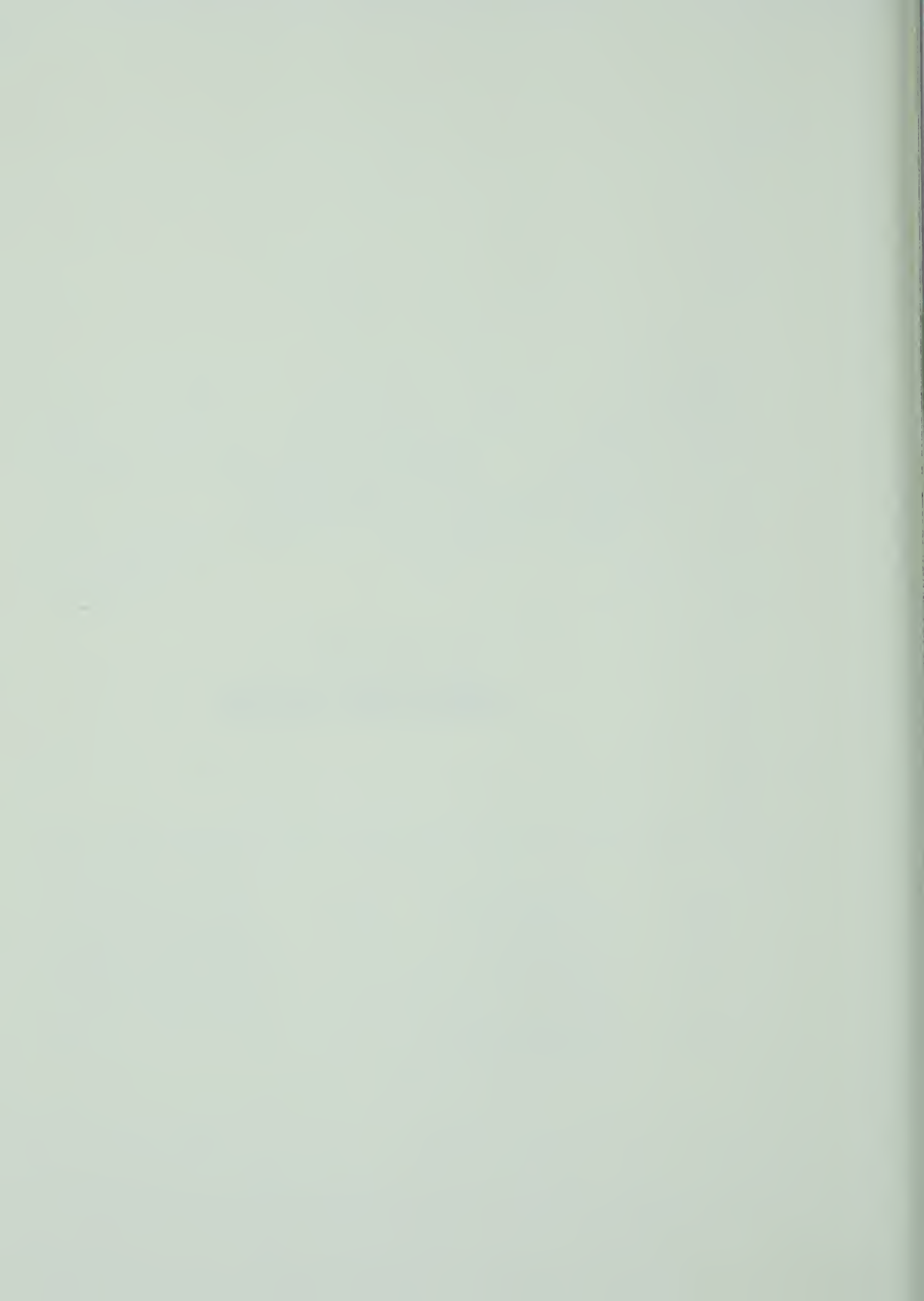
Mean reaction times for the fourth question set across the groups

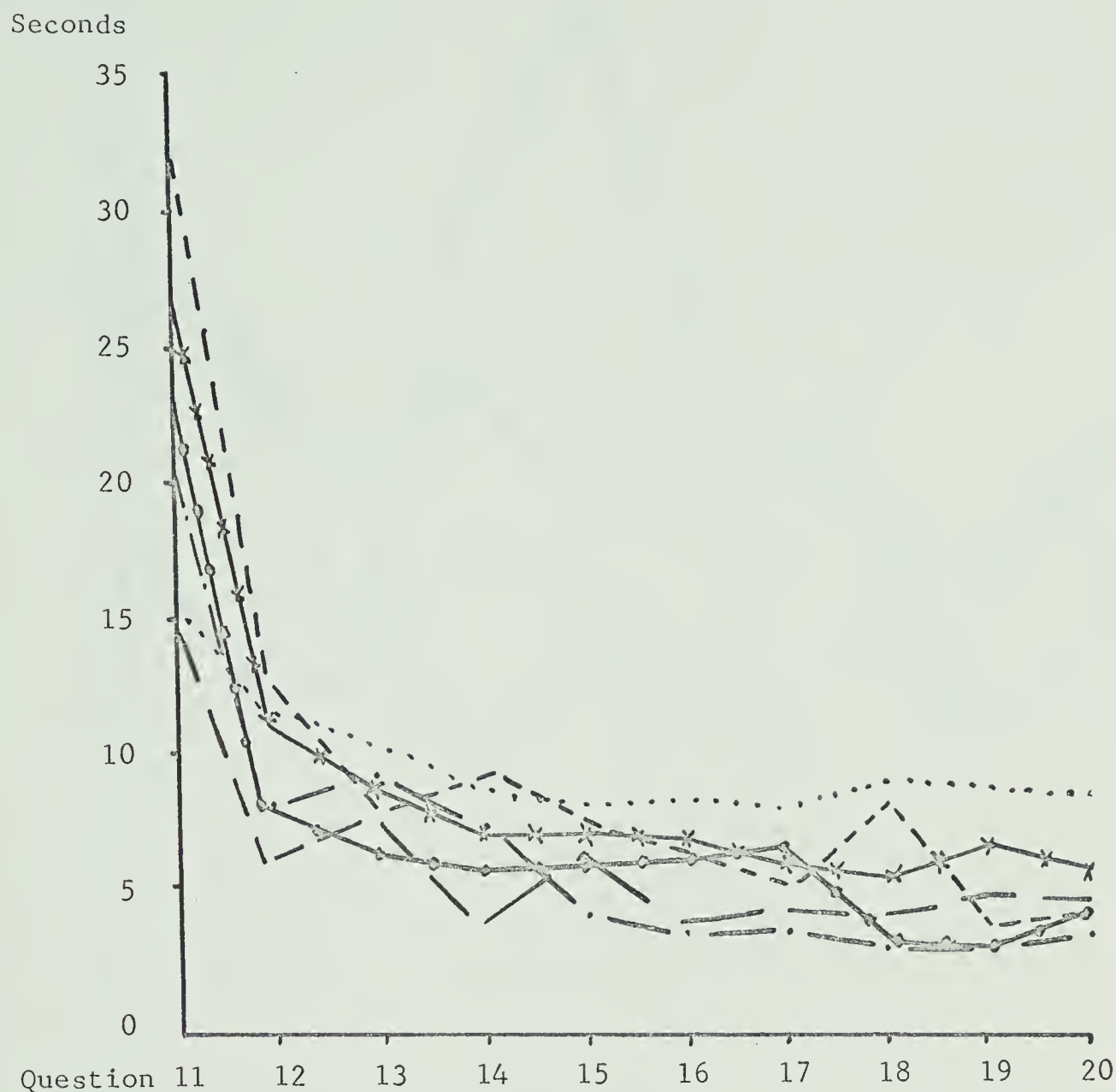




A P P E N D I X     E

GRAPHED READING TIME MEANS

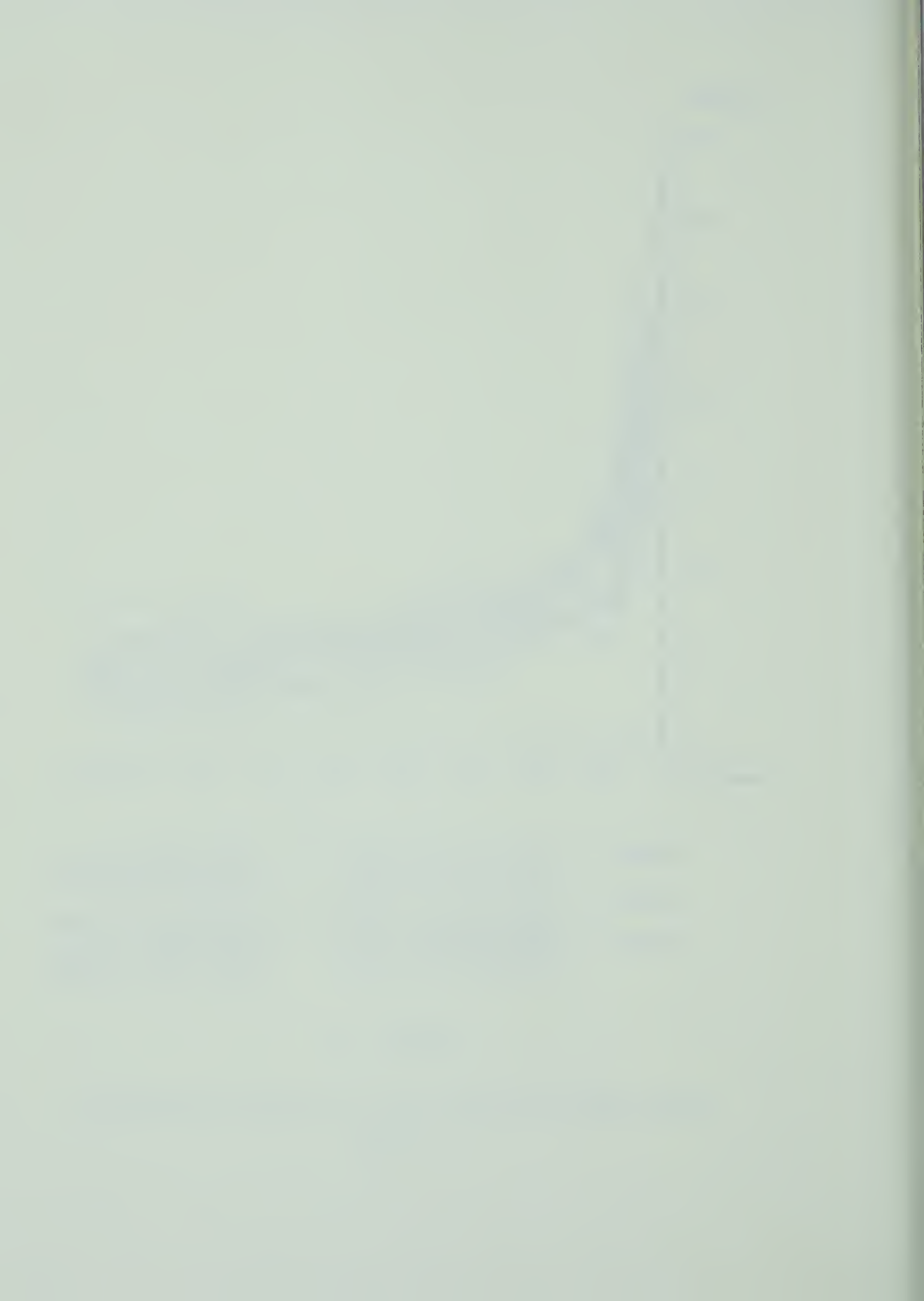




Group 2	-----	Group 5	-----○-----
	(true social press.)		(comp. press. small.)
Group 3	-----·-----	Group 6	.....
	(true comp. press.)		(group press. larger)
Group 4	-----x-----	Group 7	-----
	(group press. small.)		(comp. press. larger)

Figure 11

Group reading time means across the second ten questions in  
seconds



Seconds



Figure 12

Reading time means for the third question set across the groups



A P P E N D I X      F

READING TIME MEANS COMPARING PRESSURE METHODS





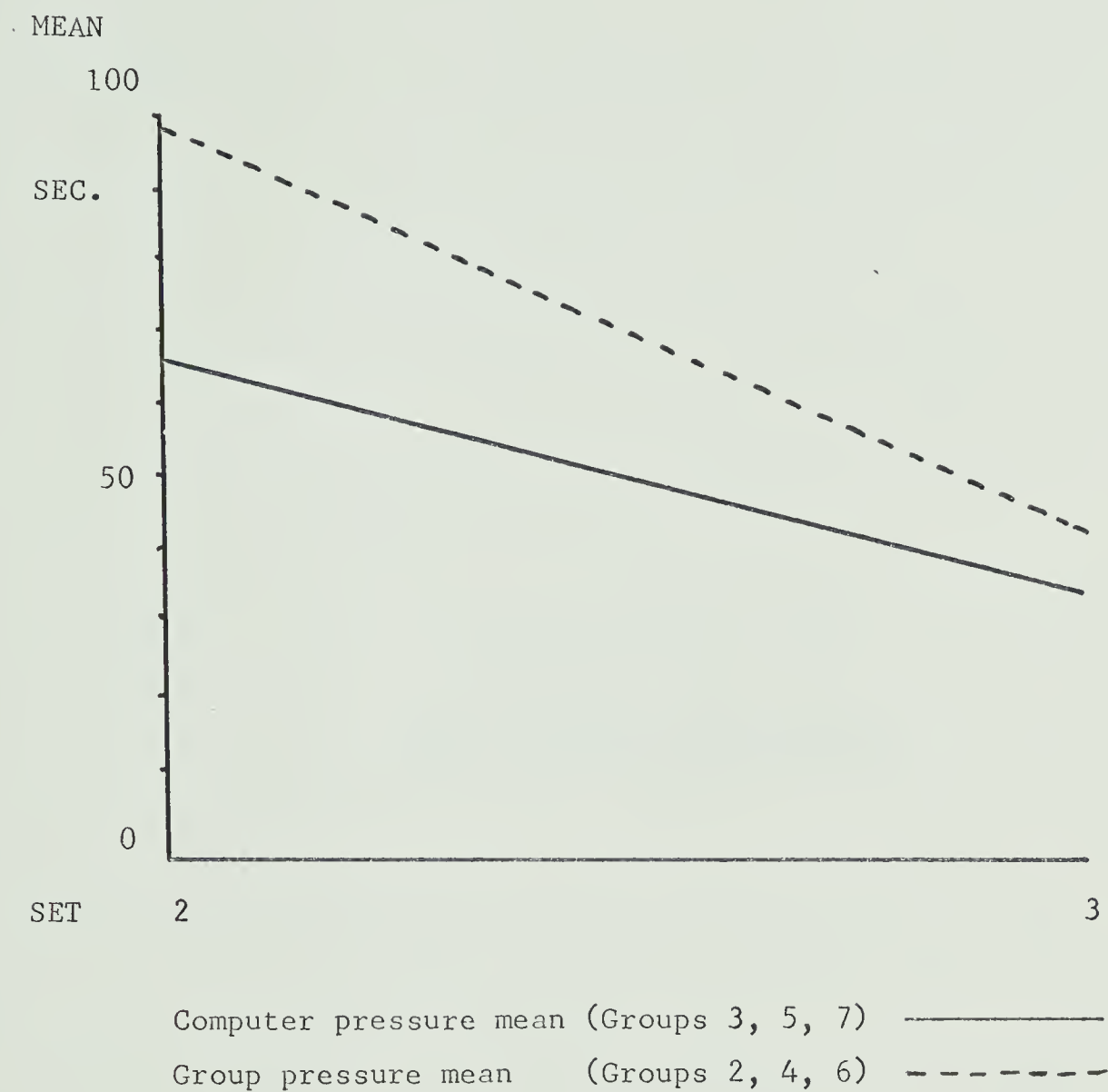


Figure 13

Reading time means across the twenty treatment questions  
comparing simulated group pressure and computer pressure



A P P E N D I X      G

POST ATTITUDE QUESTIONNAIRE



1 2 3 4 5

*(The following information was obtained from the records maintained by the Department of Corrections.)*

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_

Reason? \_\_\_\_\_



A P P E N D I X     H

COMPUTER PROGRAM INSTRUCTIONS





## PROGRAM INSTRUCTIONS

This is an experiment in solving problems. I hope that you will find it interesting. During this experiment you will be shown some straight lines on the projector to your left. When you try the first question you will see one straight line for a short period of time. Then you will be shown five more lines. You are to choose the line which you think is the same length as the first line you saw. If you cannot find a line that is the same length, choose the one you think is nearest.

When you have chosen the line you think is correct, type the number you see under it on the typewriter keys using the numbers 1, 2, 3, 4, and 5 which are on the left side of the top row of the keyboard. Try to do as well as you can.

There will be forty questions. For the first ten questions you will not be given any help. During the next twenty questions you may be given help. On the last ten questions you will not be given help to see if you have improved. Try to do your best. Please do not look about or talk with your friends.

You may not agree with the answers given for the questions all the time, as the questions are quite difficult.



# A P P E N D I X I

## SAMPLE TASK





Figure 14  
First Stimulus



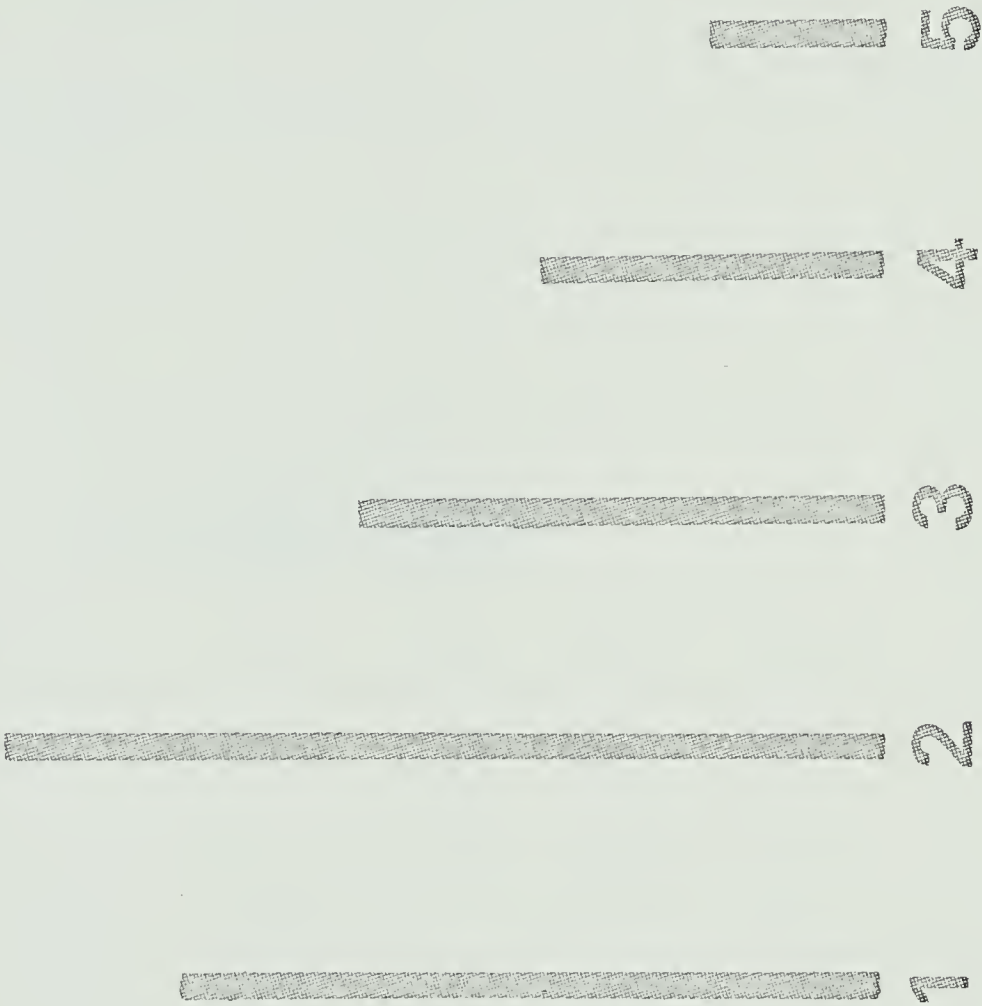


Figure 15  
Alternate Set





A P P E N D I X     J

LINE LENGTHS FOR TASKS



TABLE XXVI

## QUESTION SETS ONE AND FOUR

LINE POSITION NUMBER		1	2	3	4	5
QUESTION	LINE LENGTH	ALTERNATE SET LENGTHS (INCHES)				
1.	3 3/4	1 1/2	2 1/4	3 3/4	3	4 1/2
2.	4 1/2	3	4 1/2	3 3/4	5 1/4	2 1/4
3.	2 1/4	1 1/2	3 3/4	3	2 1/4	4 1/2
4.	3 3/4	2 1/4	3 3/4	5 1/4	3	4 1/2
5.	2 9/10	5 1/10	3 6/10	2 1/10	4 4/10	2 9/10
6.	5 1/10	4 3/10	3 6/10	5 1/10	5 9/10	2 9/10
7.	3	3	2 1/4	3 3/4	4 1/2	5 1/4
8.	3 3/4	4 1/2	3	2 1/4	5 1/4	3 3/4
9.	2 9/10	3 6/10	4 4/10	5 1/10	2 9/10	2 1/10
10.	4 4/10	4 4/10	5 1/10	2 9/10	5 9/10	3 6/10



TABLE XXVII

## QUESTION SETS TWO AND THREE

LINE POSITION NUMBER		1	2	3	4	5
QUESTION	LINE LENGTH	ALTERNATE SET LENGTHS (INCHES)				
1.	4 4/10	2 1/10	3 6/10	2 9/10	4 4/10	5 1/10
2.	3 6/10	5 9/10	5 1/10	3 6/10	2 9/10	4 4/10
3.	4 4/10	4 4/10	5 1/10	3 6/10	2 9/10	5 9/10
4.	4 1/2	3 3/4	2 1/4	3	5 1/4	4 1/2
5.	3 3/4	4 1/2	5 1/4	3 3/4	2 1/4	3
6.	2 1/4	3 3/4	2 1/4	1 1/2	3	4 1/2
7.	3	2 1/4	5 1/4	3 3/4	3	4 1/2
8.	2 9/10	5 1/10	2 1/10	3 6/10	4 4/10	2 9/10
9.	4 4/10	4 4/10	5 1/10	2 9/10	3 6/10	5 9/10
10.	3 6/10	4 4/10	3 6/10	5 1/10	2 1/10	2 9/10



# A P P E N D I X    K

## RESEARCH DESIGN





Question Set #1,		2,	3,	4
# of trials	10	10	10	10
-----				
Group 1	0		0	0
Group 2	0		X	0
Group 3	0		X	0
Group 4	0		X	0
Group 5	0		X	0
Group 6	0		X	0
Group 7	0		X	0
-----				

Figure 16

Research Design



A P P E N D I X      L

LETTER TO STUDENTS EXPLAINING PROJECT



May 30, 1969  
Dept. of Educational Psychology  
Univ. of Alberta, Edmonton

To: Grade 8 Avalon Students, thank you.

The study which you have participated in on the IBM 1500 System was an experiment in group pressure. Approximately 110 students were involved. They were divided into groups of about 15 students and presented with a simple vertical line judgement task. Each group received different treatment in the form of the information which was given to them prior to each question presented to them during treatment. The basic design of the experiment is as shown below. By finding the group that you were in you can determine what form of pressure (if any) you were subjected to . . . .

QUESTION	#1 - 10	#11 - 30	#31 - 40
*****			
Group 1	0	0	0
Group 2	0	X <sub>1</sub>	0
Group 3	0	X <sub>2</sub>	0
Group 4	0	X <sub>3</sub>	0
Group 5	0	X <sub>4</sub>	0
Group 6	0	X <sub>5</sub>	0
Group 7	0	X <sub>6</sub>	0
*****			

- 0 - An observation, no treatment at all.
- X<sub>1</sub> - An artificial group was used to create the effect of telling you what your friends chose when they answered the question. (Some of your friends have answered ....) In this case the correct answers were given.
- X<sub>2</sub> - In this case the computer simply stated: The correct answer is . . . . The correct answer was given here also.
- X<sub>3</sub> - The answer was presented in the same way as in X<sub>1</sub>. However, the answer given as correct was really smaller than the correct answer for every question.
- X<sub>4</sub> - The answer presented in the same way as X<sub>2</sub>. However, the answer given as correct was really smaller than the correct answer for every question.
- X<sub>5</sub> - The answer was presented in the same way as X<sub>1</sub>. However, the answer given as correct was really larger than the correct answer given for every question.



- X<sub>6</sub> - The answer was presented in the same way as X<sub>2</sub>. However, the answer given as correct was really larger than the correct answer for every question.

The treatment or 'answer' which was presented prior to your making a decision was further aided by having the computer tell you that you did very well if you chose the answer which the computer presented as correct, and simply moving you to the next question after a 3 second pause if you chose any other answer. The first 10 questions were to establish a base line regarding the number of correct answers which you obtain with this form of task. Most people get almost all of the questions correct. The last 10 questions were to establish whether or not you would continue to choose the 'answers' when you were not told how well you were doing and were not given any answer to choose.

Although there are no final results yet, it appears that the experiment will have findings which are similar to other experiments which use groups of people who are told to try and convince you that the answer which the experimenter wants you to choose is correct. From a cursory examination, it appears that from about one in five to four in five persons exposed to this form of pressure agree with the computer when the incorrect answers are given (depending on the form of pressure), and virtually all agreed if the correct answer was given by the computer. This indicates that a programmer should be careful of his opinions and facts as he may easily influence people by incorrectly programming. It also indicates that people should be trained to be more critical of machines and books, radio and TV, newspapers and magazines, for the facts and opinions presented may not always be correct. We cannot even be completely certain that the opinion of the majority is reflected in the programs and articles.

HIDDEN FIGURES TEST - The data will be used to give some indication of how well students do on this test when it is given by computer as compared to the same test on paper with a pencil. About 15 students were able to take this test.

In both tests above, the data obtained will be the answers you made to the questions and your reaction time for the questions. Part of the data will comprise a portion of my Master's Thesis and will be analyzed by statistical tests on the IBM 360/67.

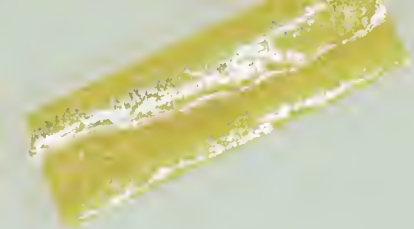
COMPUTER PROGRAMS - If you have an idea for a program that you would like to see on the 1500 System, please contact me by letter and outline your idea. If I use the idea I will give you full credit for it in the documentation and insert your name at the beginning of the program so that people will know whose idea it was. The idea may be in almost any field: simple games, spelling, arithmetic, perhaps a better way of presenting material so that people will learn faster and better, geography, electronics, an experiment, etc. Please write to:

C. A. Marshall  
c/o Department of Educational Psychology (B77)  
Faculty of Education, Univ. of Alberta,  
Edmonton











**B29924**